KBox C-101 Family

User's Guide (Version 3.00)
1055-6575

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2. Introduction

Kontron would like to point out that the information contained in this manual may be subject to technical alteration, particularly as a result of the constant upgrading of Kontron products. The attached documentation does not entail any guarantee on the part of Kontron with respect to technical processes described in the manual or any product characteristics set out in the manual. Kontron does not accept any liability for any printing errors or other inaccuracies in the manual unless it can be proven that Kontron is aware of such errors or inaccuracies or that Kontron is unaware of these as a result of gross negligence and Kontron has failed to eliminate these errors or inaccuracies for this reason. Kontron expressly informs the user that this manual only contains a general description of technical processes and instructions which may not be applicable in every individual case. In cases of doubt, please contact Kontron.

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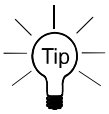
2.1. Symbols used in this Manual

Symbol	Meaning
	This symbol indicates the danger of injury to the user or the risk of damage to the product if the corresponding warning notices are not observed.
	This symbol indicates that the product or parts thereof may be damaged if the corresponding warning notices are not observed.
	This symbol indicates general information about the product and the user manual.
	This symbol indicates detail information about the specific product configuration.
	This symbol precedes helpful hints and tips for daily use.

2.2. Information about the System Designation and Description in this Manual

This manual includes description and specifications for the KBox C-101 Family product line.

2.2.1. Product Variants of the KBox C-101 Family

Used Designation	
KBox C-101	Description is valid for all variants
KBox C-101-2	Description is valid only for KBox C-101-2 (configuration with two rows for PCIe slots and DRIVES)
KBox C-101-2 with fan tray	Description is valid only for KBox C-101-2 systems (configuration with two rows for PCIe slots and DRIVES) The system is equipped with the optional fan tray
KBox C-101-1	Description is valid only for KBox C-101-1 systems (configuration with one row for PCIe slot and DRIVE)
KBox C-101-1 with fan tray	The description of the fan tray is like this one for KBox C-101-2. The mechanical fan tray components are the same, but with corresponding dimensions for KBox C-101-1.
KBox C-101-0	Description is valid only for KBox C-101-0 systems (without any row for PCIe slot and DRIVE)

	For the different KBox C-101 configurations refer also to chapter 18 "Technical Specifications" and section 7.4 "Front Side Configuration and Options - KBox C-101".

3. Important Instructions

Prior performing any installation or commissioning work with the device, this manual must be read carefully to become familiar with the device. The general safety instructions and information apply to all Kontron equipment for industrial control applications.

This manual provides important information required for the proper operation of the KBox C-101!
This chapter contains instructions which must be observed when working with the KBox C-101.

3.1. Obligation of Diligence

The operator must ensure that industrial PCs of the KBox Series are only used in control cabinet environments, the operation manual is understood and the personnel has the necessary authorization and regularly training about relevant standards, regulations and instructions.

Further the operator must ensure that the industrial PC is mounted, operated and maintained according to the instruction of this manual.

Depending on the target application the operator must observe the current applicable national and international regulations and standards.

3.2. Personnel

Only personnel with appropriate qualifications, trainings and authorization are permitted to install and work with the Kontron KBox C-101 industrial PC.

All applicable technical standards, regulations and guidelines for the installation and usage of the device must be understood and followed. Further accident prevention regulations and directives must be observed.

Every user of this system must be familiar with the instructions described in this manual.

3.3. Appropriate Use, Field of Application

The KBox C-101 is to be used in control cabinet applications only. Necessary fire enclosures and similar safety measures are to be provided by the control cabinet. The operator must ensure that the place of installation complies with applicable national and international standards and regulations.

3.4. Warranty Note

Due to their limited service life, parts which by their nature are subject to a particularly high degree of wear (wearing parts) are excluded from the warranty beyond that provided by law. This applies e.g., to battery, buffer battery and/or storage media like SD card.

3.5. Exclusion of Accident Liability Obligation

Kontron shall be exempted from the statutory accident liability obligation if the user fails to observe the included document: "General Safety Instructions for IT Equipment" the hints in this manual or eventually the warning signs label on the device.

3.6. Liability Limitation / Exemption from the Warranty Obligation

In the event of damage to the device caused by failure to observe the "General Safety Instructions for IT Equipment" in this manual or eventually the warning signs label on the device, Kontron shall not be required to honor the warranty even during the warranty period and shall be exempted from the statutory accident liability obligation.

4. General Safety Instructions for IT Equipment

Please read this chapter carefully and take careful note of the instructions, which have been compiled for your safety and to ensure to apply in accordance with intended regulations. If the following general safety instructions are not observed, it could lead to injuries to the operator and/or damage of the product; in cases of nonobservance of the instructions Kontron is exempt from accident liability, this also applies during the warranty period.

The product has been built and tested according to the basic safety requirements for low voltage (LVD) applications and has left the manufacturer in safety-related, flawless condition. To maintain this condition and to also ensure safe operation, the operator must not only observe the correct operating conditions for the product but also the following general safety instructions:

- ❑ The product must be used as specified in the product documentation, in which the instructions for safety for the product and for the operator are described. These contain guidelines for setting up, installation and assembly, maintenance, transport or storage.
- ❑ The on-site electrical installation must meet the requirements of the country's specific local regulations.
- ❑ If a power cable comes with the product, only this cable should be used. Do not use an extension cable to connect the product.
- ❑ To guarantee that sufficient air circulation is available to cool the product, please ensure that the ventilation openings are not covered or blocked. If an air filter is provided, this should be cleaned regularly. Do not place the system close to heat sources or damp places. Make sure the system is well ventilated.
- ❑ Only devices or parts which fulfill the requirements of SELV circuits (Safety Extra Low Voltage) as stipulated by IEC 60950-1 may be connected to the available interfaces.
- ❑ Before opening the device, make sure that the device is disconnected from the mains.
- ❑ Switching off the device by its power button does not disconnect it from the mains. Complete disconnection is only possible if the power cable is removed from the wall plug or from the device. Ensure that there is free and easy access to enable disconnection.
- ❑ The device may only be opened for the insertion or removal of add-on cards (depending on the configuration of the system). This may only be carried out by qualified operators.
- ❑ If extensions are being carried out, the following must be observed:
  - all effective legal regulations and all technical data are adhered to
  - the power consumption of any add-on card does not exceed the specified limitations
  - the current consumption of the system does not exceed the value stated on the product label.
- ❑ Only original accessories that have been approved by Kontron can be used.
- ❑ Please note: safe operation is no longer possible when any of the following applies:
  - the device has visible damages or
  - the device is no longer functioning

  In this case the device must be switched off and it must be ensured that the device can no longer be operated.

Additional safety instructions for DC power supply circuits

- ❑ To guarantee safe operation of devices with DC power supply voltages larger than 60 volts DC or a power consumption larger than 240 VA, please observe that:
  - the device is set up, installed and operated in a room or enclosure marked with "RESTRICTED ACCESS", if there are no safety messages on product as safety signs and labels on the device itself.
  - no cables or parts without insulation in electrical circuits with dangerous voltage or power should be touched directly or indirectly
  - a reliable protective earthing connection is provided
  - a suitable, easily accessible disconnecting device is used in the application (e.g. overcurrent protective device,), if the device itself is not disconnectable
  - a disconnect device, if provided in or as part of the equipment, shall disconnect both poles simultaneously
  - interconnecting power circuits of different devices cause no electrical hazards
- ❑ A sufficient dimensioning of the power cable wires must be selected – according to the maximum electrical specifications on the product label – as stipulated by EN60950-1 or VDE0100 or EN60204 or UL508 regulations.
- ❑ The devices do not generally fulfill the requirements for "centralized DC power systems" (UL 60950-1, Annex NAB; D2) and therefore may not be connected to such devices!

4.1. Electrostatic Discharge (ESD)

A sudden discharge of electrostatic electricity can destroy static-sensitive devices or micro-circuitry. Proper packaging and grounding techniques are necessary precautions to prevent damage. Always take the following precautions:

1. Transport boards in static-safe containers such as boxes or bags.
2. Keep electrostatic sensitive parts in their containers until they arrive at the ESD-safe workplace.
3. Always be properly grounded when touching a sensitive board, component, or assembly.
4. Store electrostatic-sensitive boards in protective packaging or on antistatic mats.

4.1.1. Grounding Methods

The following measures help to avoid electrostatic damages to the device:

1. Cover workstations with approved antistatic material. Always wear a wrist strap connected to workplace as well as properly grounded tools and equipment.
2. Use anti-static mats, heel straps, or air ionizes to give added protection.
3. Always handle electrostatic sensitive components by their edge or by their casing.
4. Avoid contact with pins, leads, or circuitry.
5. Turn off power and input signals before inserting and removing connectors or connecting test equipment.
6. Keep work area free of non-conductive materials such as ordinary plastic assembly aids and styrofoam.
7. Use field service tools such as cutters, screwdrivers, and vacuum cleaners which are conductive.
8. Always place drives and boards PCB-assembly-side down on the foam.

4.2. Instructions for the Lithium Battery

If ordered, your KBox C-101 is equipped with a lithium battery (externally-accessible); refer to the section 7.2 "Optional RTC Lithium Battery (externally-accessible)".

When replacing the lithium battery, please follow the corresponding instructions in the section 13.1 "Replacing the Lithium Battery".

Caution

Danger of explosion when replacing with wrong type of battery. Replace only with the same or equivalent type recommended by the manufacturer. The lithium battery type must be UL recognized.

Do not dispose of lithium batteries in general trash collection. Dispose of the battery according to the local regulations dealing with the disposal of these special materials, (e.g. to the collecting points for dispose of batteries).

5. Electromagnetic Compatibility (Class B Device)

5.1. Electromagnetic Compatibility (EU)

This product complies with the European Council Directive on the approximation of the laws of the member states relating to electromagnetic compatibility (2004/108/EC), Class B limits for Information Technology Equipment according to European Standard EN 55022.

5.2. FCC Statement (USA)

The following statement applies to the products covered in this manual, unless otherwise specified herein.
The statement for other products will appear in the accompanying documentation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- ❑ Reorient or relocate the receiving antenna.
- ❑ Increase the separation between the equipment and receiver.
- ❑ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- ❑ Consult the dealer or an experienced radio/TV technician for help.

Kontron Europe GmbH is not responsible for any radio television interference caused by unauthorized modifications of this equipment or the substitution or attachment of connecting cables and equipment other than those specified by Kontron Europe GmbH. The correction of interference caused by such unauthorized modification, substitution or attachment will be the responsibility of the user.
The use of shielded I/O cables is required when connecting this equipment to any and all optional peripheral or host devices. Failure to do so may violate FCC and ICES rules.

5.3. EMC-Compliance (Canada)

The method of compliance is self-declaration to Canadian ICES-003:

(English): This Class B digital apparatus complies with the Canadian ICES-003.

(French) : Cet appareil numérique de la class B est conforme à la norme NMB-003 du Canada.

6. Shipment and Unpacking

6.1. Unpacking

Proceed as follows to unpack the unit:

1. Remove packaging.
2. Do not discard the original packaging. Keep it for future relocation.
3. Check the delivery for completeness by comparing it with your order.
4. Please keep the associated paperwork. It contains important information for handling the unit.
5. Check the contents for visible shipping damage.
6. If you notice any shipping damage or inconsistencies between the contents and your order, please contact Kontron for help and information.

6.2. Scope of Delivery

- ❑ KBox C-101 (corresponding to the ordered system configuration)
- ❑ POWER-SUBCON PSC 1,5/ 3-F, 3-pin plug
- ❑ General Safety Instructions for IT Equipment

6.2.1. Optional Parts (System Expansion)

- ❑ Front accessible drive bays for 2.5"SATA HDD/SSDs
- ❑ Mini-PCIe cards
- ❑ mSATA cards (MO-300)
- ❑ PCIe cards

6.2.2. Optional System Extension

- ❑ RS232/RS422 Port: via internal factory mounted and configured RS232/RS422 adapter module
- ❑ CAN Port: via internal factory mounted CAN adapter module
- ❑ DVI-D (single Link) Port or DisplayPort (via internal factory mounted adapter modules)
- ❑ Optional externally accessible RTC lithium battery
- ❑ Optional system expansion with fan tray

Please observe the different configuration options for each system of the KBox C-101 family.
Refer to chapter 18 "Technical Specifications" and the descriptions in this manual.

6.3. Spare Parts

The following spare parts are available for field replacement:

Spare Part	Part Number	
	KBox C-101-2	KBox C-101-1
Fan tray	1055-4009	1056-7503
Air filter	1055-4670	1056-7507

6.4. Type Label and Product Identification

The type label (product name, serial number, part number, production date) of your KBox C-101 system is located on the right side of the device (refer to Fig. 1 and Fig. 28, pos. 9).

Fig. 1: Example of KBox C-101 type label

System Type	Product Designation	Product Identifikation
KBox C	KBox C-101	KBox C-101-**2:** corresponds for system configurations with two slot rows for the optional removable DRIVEs and/or PCIe expansion slots KBox C-101-**1:** corresponds for system configurations with one slot row for the optional removable DRIVE and/or PCIe expansion slot KBox C-101-**0:** corresponds for system configuration without any slot row for the optional removable DRIVE and PCIe expansion slot

7. System Overview

The KBox C-101 Family is a highly scalable and flexible industrial computer platform that offers high-end performance for industrial automation application such as control or process monitoring.

The performance scalability is achieved by deploying various Kontron COMExpress® CPU modules (from factor basic and type 6 pinout) inside the system.

The system flexibility is a result of the basic design concept of using a baseboard which provides the COMExpress® and a set of standard IO interfacing plus a comprehensive optionally available IOs and devices.

The KBox C-101 offers a maintenance free (Wartungsfrei) operation. That means it operates without battery, fans and rotating media (HDD).

The KBox C-101 family comprises three different chassis versions:

- The KBox C-101-2 with two PCI/PCIe expansion slots and spaces for up to two 2.5" SATA SSDs/HDDs
- The KBox C-101-1 with one PCIe expansion slot and space for one 2.5" SATA SSD/HDD
- The KBox C-101-0 without PCIe expansion slot and space for one internal 2.5" SATA SSD/HDD

Fig. 2: KBox C-101 Family

Standard Front Panel:

The following interfaces are available with the KBox C-101:

- ❑ 24VDC input power (X101)
- ❑ 3x Gigabit Ethernet (X102, X103, X104)
- ❑ 2x USB 3.0 (X105, X106)
- ❑ 2x USB 2.0 (X107, X108)
- ❑ DisplayPort (X109)
- ❑ SD Card slot (without X numbered slot)
- ❑ RS232 serial (X110)
- ❑ Buttons with corresponding LEDs:
  - RSQ (rescue)
  - PWR (power)
- ❑ LEDs:
  - GP1 to GP4 (general purpose LEDs)
  - THERM (thermal status)
  - DRIVE (SSD/HDD drive status)
  - SD (SDHC/SDXC status)
  - WD (Watchdog status)

Standard Baseboard - Onboard and System Expansion Capabilities:

- up to 2x SATA and power connector (for internal or removable devices, depending on the KBox C-101 configuration)
- 2x mSATA sockets
- 2x Mini PCIe x1 sockets (one socket is on the top side, the second one on the bottom side of the baseboard)
- 1x PCIe x8 socket for expansion via riser cards:
  - up to 2x PCIe x4 sockets on riser card (depending on the KBox C-101-2/-1 configuration) or
  - 1x PCI (32 bit) and 1x PCIe x4 sockets on riser card (available for KBox C-101-2 only)

Optional System Extension:

- ❑ RS232/RS422 Port: via internal factory mounted and configured RS232/RS422 adapter module
- ❑ CAN Port: via internal factory mounted CAN adapter module
- ❑ DVI-D Port (single Link) or DisplayPort (via corresponding internal factory mounted adapter modules)
- ❑ Optional external accessible RTC lithium battery
- ❑ Optional system extension with fan tray (not possible for KBox C-101-0)

The KBox C-101 is a fanless system with a compact aluminum chassis with cooling fins.
The rated voltage range of the mains can be found on the type label. The type label is located at the right side of the device (Fig. 28, pos. 9).

The KBox C-101 is designed to be operated wall mounted inside a control cabinet, in vertical position, except with the top side facing down.

When you power on the KBox C-101, make sure that the air exhaust openings on the top side (Fig. 30, pos. 12), the air intake openings on the bottom side (Fig. 31, pos. 11) and the cooling fins of the chassis (Fig. 29, Fig. 30 and Fig. 31, pos. 6) are not obstructed (covered) by any objects.

To provide sufficient heat dissipation via the cooling fins of the device, do not cover the cooling fins of the KBox C-101. Do not place any objects on the device. When installing the system, please observe the clearance recommendation (keep out area) in the subsection 11.1 "Control Cabinet Mounting"; refer to the marked areas in Fig. 46 to Fig. 50.

7.1. RTC (GoldCap)

The baseboard of the KBox C-101 provides an "external RTC" module connected via the SMBus. An RTC module of type RV-8564 or compatible is used. To provide a valid date and time when no power is connected to the system, the RTC module is equipped with a goldcap buffer.

7.1.1. RTC Buffer Time

The RTC buffer time is depending of the ambient temperature. For a better understanding the different behavior of the goldcap buffer integrated in your system, refer to the diagram below:

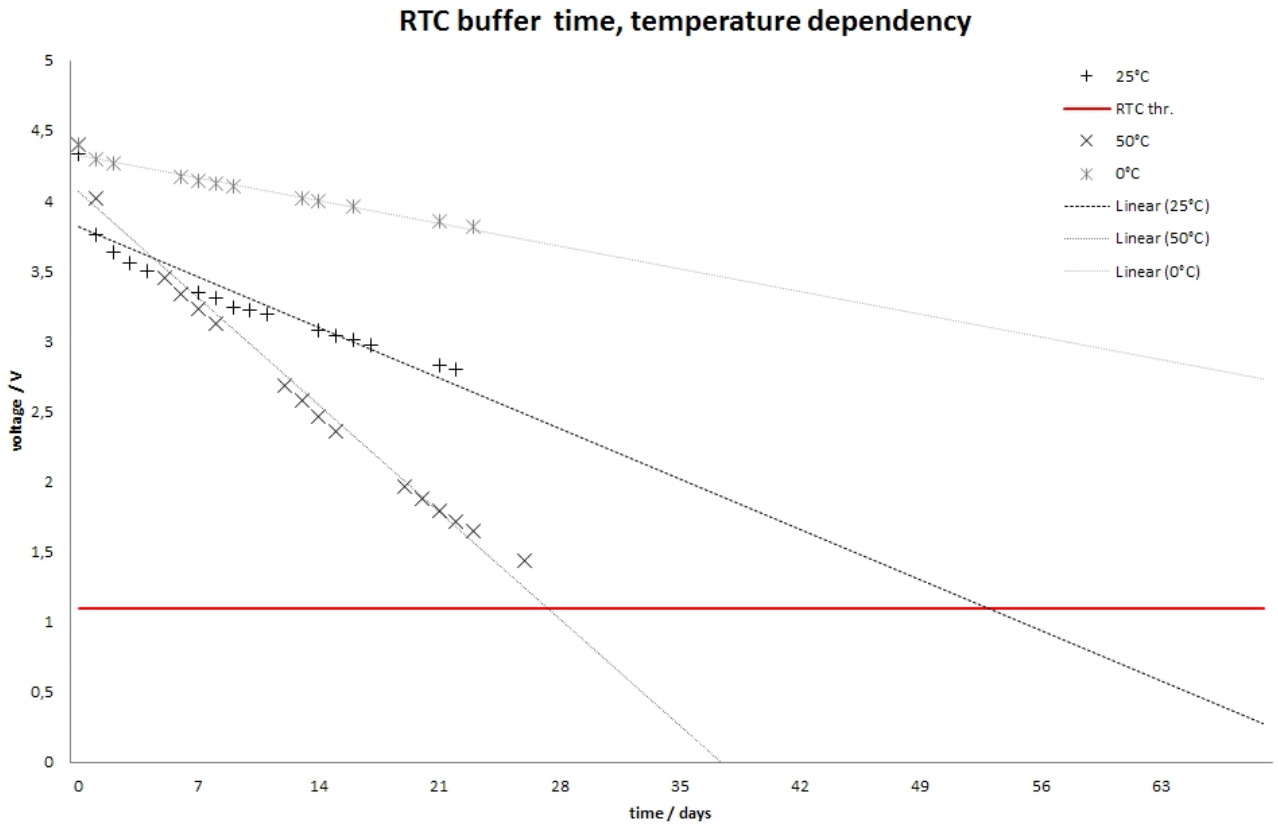


Fig. 3: RTC buffer time depending on temperature

If the time is not valid this is indicated by a status bit in the RTC registers. For details see the RV-8564 application manual.

To get the maximum buffer time, it is necessary to have the system a certain time powered on. This ensures that the buffer capacitors are fully loaded.

The buffer time depends on the ambient temperature and on how long the system is connected to the power supply.

7.1.2. Setting the RTC

During startup, the uEFI performs a comparison of chipset clock and "external RTC" module and sets the chipset clock accordingly, if the RTC time is valid. Further it is possible to set the time manually by accessing the RTC over the SMBus.

7.2. Optional RTC Lithium Battery (externally-accessible)

Your KBox C-101 can be optionally equipped with an externally-accessible lithium battery (CMOS) (Fig. 5, pos. 3). The battery and the battery holder are covered by a protective cover (refer to Fig. 4, pos. 1) secured by a Philips countersunk head screw (Fig. 4, pos. 2).

When replacing the lithium battery, please follow the corresponding instructions in the section 13.1 "Replacing the Lithium Battery".

☞	The protective cover of the KBox C-101 with externally-accessible lithium battery must always be installed during transportation and operation activities. The protective cover should be removed only when you attempt to replace the lithium battery.

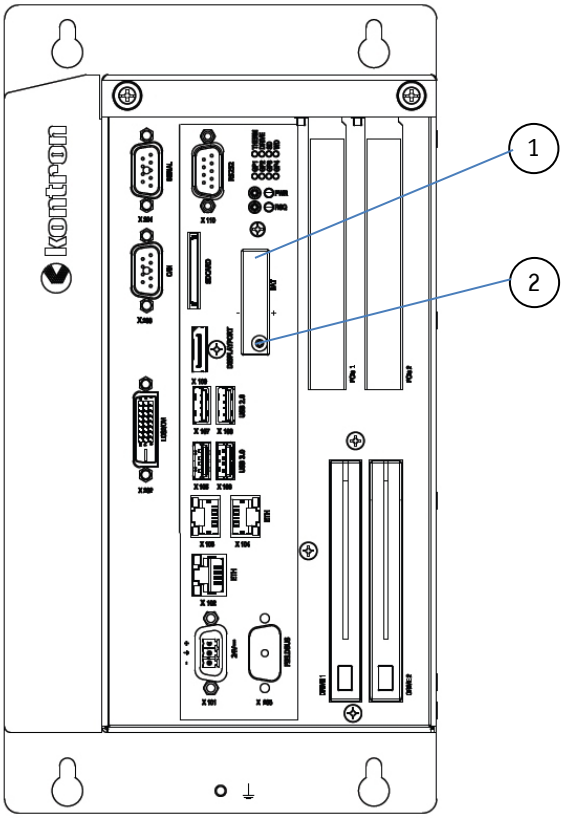


Fig. 4: Lithium battery location (shown with protective cover)

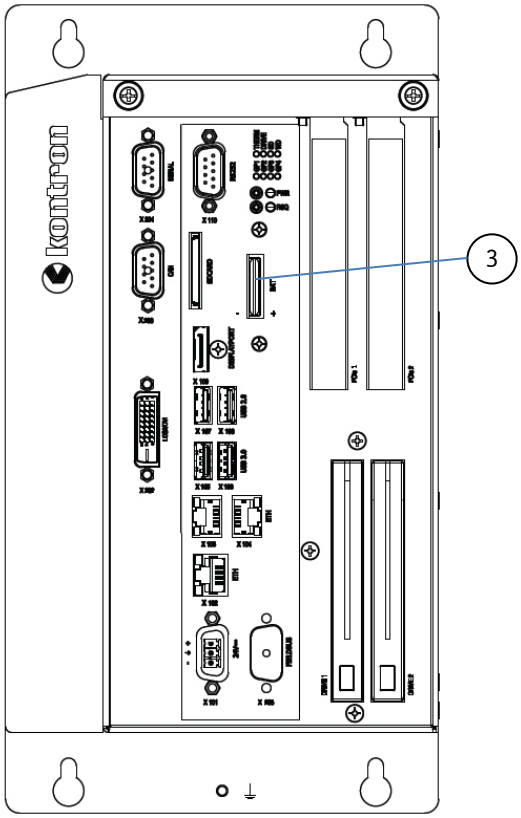


Fig. 5: Lithium battery location (externally-accessible battery shown with removed protective cover)

Legend for Fig. 4 **and** Fig. 5**:**

1 Protective cover for the lithium battery

2 Philips countersunk head screw that secure the protective cover at the front side of the chassis

3 Externally-accessible battery shown with removed protective cover

7.3. System Expansion Capabilities

For the configuration of your KBox C-101 please follow the ordering options specified in:
"Configuration Guides – KBox C-101" on our web site www.kontron.com.

7.3.1. Mini PCI Express® Interfaces

There are two Mini PCIe interfaces on the KBox C-101 baseboard.
One Mini PCIe interface connector is accessible from the top side of the KBox C-101 when the top cover is removed.

The second Mini PCIe interface connector is located on the bottom side of the baseboard and is not accessible in the field. This interface connector is intended to be used for the Fieldbus expansion. If a customer requires this system expansion, it must be selected when ordering, as this expansion has to be carried-out at factory.
Refer also to the subsections 9.3.3 and 9.3.6.

Refer to chapter 18 "Technical Specifications" and the descriptions in this manual.

7.3.2. mSATA (MO-300)

The baseboard of the KBox C-101 provides two mSATA interfaces.
These allow you to equip your system with mSATA SSDs. Refer to the subsections 9.3.2 and 9.3.7.

Refer to chapter 18 "Technical Specifications" and the descriptions in this manual.

7.3.3. Standard PCI Express® Interfaces

The baseboard of KBox C-101 provides 1x PCIe x8 interface.
Via riser cards there are available PCI/PCIe expansion possibilities as shown in the chapter 7.4 (area marked "C").

	Please observe the different configuration options regarding the PCI/PCIe cards installation, for each system variant of the KBox C-101 family. Refer to chapter 18 "Technical Specifications" and the descriptions in this manual.

7.3.4. SATA Interfaces

The baseboard of KBox C-101 provides two SATA interfaces. These allow the installation of up to two internal 2.5" SATA HDDs/SSDs or optional front accessible drive bays for 2.5" SATA HDDs/SSDs (refer to the subsection 7.4.13 "Internal or Removable 2.5" SATA HDDs/SSDs").

	Please observe the different configuration options, regarding the installation of 2.5" SATA HDD/SSD devices, for each system of the KBox C-101 family (refer to the area marked "D" in the section 7.4). Refer to chapter 18 "Technical Specifications" and the descriptions in this manual.

Fig. 6 **to** Fig. 12**: Views of a KBox C-101-2**

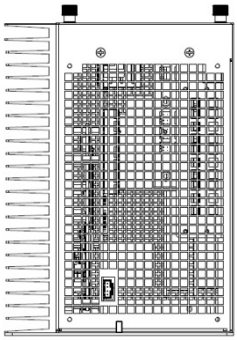


Fig. 6: Bottom side view

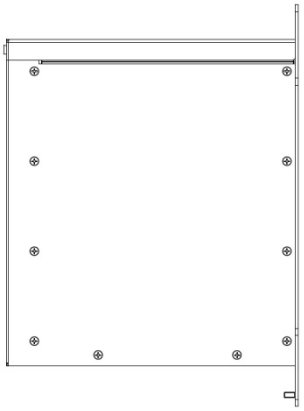


Fig. 7: Right side view

Fig. 8: Front side view config. with removable drives

Fig. 9: Front side view config. without removable drives

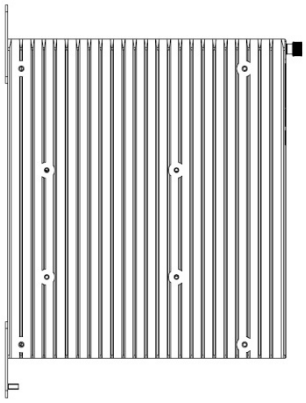


Fig. 10: Left side view

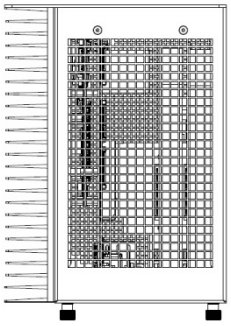


Fig. 11: Top side view

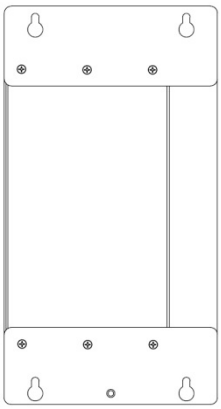


Fig. 12: Rear side view

7.4. Front Side Configuration and Options - KBox C-101

	Standard Interfaces		KBox C-101-2		KBox C-101-1		KBox C-101-0	
	Power Input Connector (X101)		1x		1x		1x	
	Ethernet (X102/X103/X104)		3x		3x		3x	
	USB 3.0 (X105/X106)		2x		2x		2x	
	USB 2.0 (X107/X108)		2x		2x		2x	
	DisplayPort (X109)		1x		1x		1x	
	SD Card Slot		1x		1x		1x	
	RS232 (X110)		1x		1x		1x	
	FIELDBUS (X205); option - factory installed only		1x		1x		1x	
B	**Extension Capabilities (Options)**							
	CAN Port (X203)		1x		1x		1x	
	RS232/RS422 Port (X204)		1x		1x		1x	
	DVI-D Port (X202)		1x	-	1x	-	1x	-
	DisplayPort (DP 2) (X202)		-	1x	-	1x	-	1x
C	**PCI/PCIe Expansions via corresponding Riser Cards (Options)**							
	PCIe 1 Slot	PCIe x4 socket	1x		1x		-	
	PCIe 2 Slot	PCIe x4 socket	1x	-	-		-	
		PCI (32 bit) socket	-	1x				
D	**Internal or externally accessible 2.5" SATA HDD/SSD (Options)**							
	Internal 2.5" SATA HDD/SSD		2x	-	1x		1x	
	Removable Drive Bay for 2.5" SATA HDD/SSD (DRIVE 1)		-	1x	1x		-	
	Removable Drive Bay for 2.5" SATA HDD/SSD (DRIVE 2)		-	1x	-		-	
E	**Externally accessible CMOS Battery (Option)**							
	CR 2025, 3V		1x		1x		1x	
F	**Fan Tray (Option)**							
	Fan Tray		1x		1x		-	

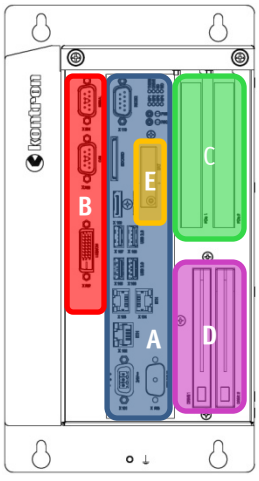


Fig. 13: KBox C-101-2

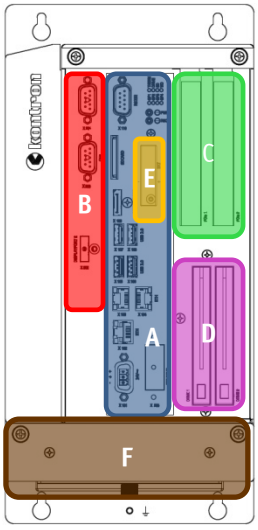


Fig. 14: KBox C-101-2 with fan tray

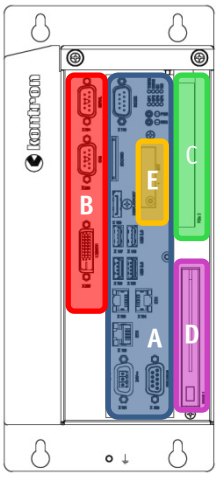


Fig. 15: KBox C-101-1

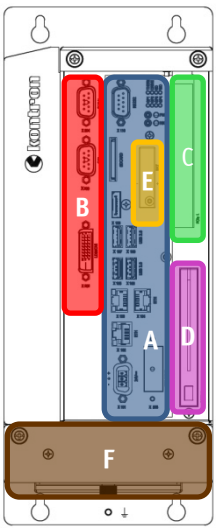


Fig. 16: KBox C-101-1 with fan tray

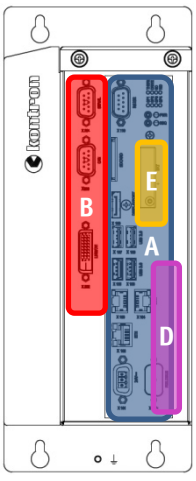
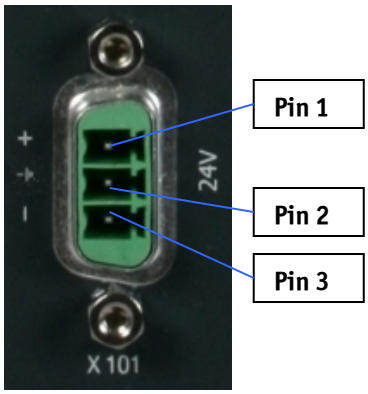


Fig. 17: KBox C-101-0

7.4.1. X101 - Power Input Connector

The 3-pin connector (X101, Fig. 18 and Fig. 58) provides the power connection of the KBox C-101 system to an appropriate DC main power supply. For pin assignments refer to the subsection 20.1.1.

The external cable connector is a Phoenix PSC 1,5/ 3-M, 3-pin plug with an SCT-D-SUB 9-KG housing. This power plug is delivered along with the KBox C-101. Please observe the section 12.1 "Connecting to DC Main Power Supply". The mating connector is a Phoenix PSC 1,5/ 3-F connector.



Pin	Signal Name
1	+24 VDC (input)
2	Functional Earth
3	0V (input)

Fig. 18: X101 - 24VDC power input connector

7.4.2. X102/X103/X104 - Ethernet Connectors (ETH)

These connectors (X102/X103/X104, Fig. 58, Fig. 60 and Fig. 63) are Gigabit Ethernet 10/100/1000 Mbit/s, IEEE 1588 capable interfaces. The connectors are standard 8-pin RJ45 type connectors with status LEDs:

- Activity/link: green = link up; green blinking = activity.
- Speed: off, green, yellow (10/100/1000 Mbit/s).

For pin assignment refer to subsection 20.1.6.

7.4.3. X105/X106 - USB 3.0

The KBox C-101 provides two USB 3.0/2.0 interfaces. These connectors (X105/X106, Fig. 58, Fig. 60 and Fig. 63) allow connection of USB 3.0 or USB 2.0 compatible devices to the system.
For pin assignment refer to subsection 20.1.5.

7.4.4. X107/X108 - USB 2.0

The KBox C-101 provides two USB 2.0/1.1 interfaces. These connectors (X107/X108, Fig. 58, Fig. 60 and Fig. 63) allow connection of USB 2.0 or USB 1.1 compatible devices to the system.
For pin assignment refer to subsection 20.1.4.

7.4.5. X109 - DisplayPort

It is a DisplayPort compliant interface realised using a standard DisplayPort connector. An external (digital) display can be connected to the DisplayPort connector (X109, Fig. 58, Fig. 60 and Fig. 63).
For pin assignment refer to subsection 20.1.3.

7.4.6. SDCARD Slot

This slot, marked "SDCARD" is an SDHC/SDXC compliant interface realised using a standard SD card connector. It is accessible at the front side of the KBox C-101 (Fig. 58, Fig. 60 and Fig. 63) and is located between the serial interface (RS232/X110) and DISPLAYPORT (X109).

- ❑ This SD card reader supports SD, SDHC and SDXC cards.
- ❑ SD card activity is indicated by the SD LED on the KBox C-101 front side.
- ❑ This interface permits hot-plugging of the SD card. The system can also be booted from this interface.

Fig. 19: SDCARD slot

Fig. 20: SD card (not included)

This interface supports hot-plugging.

To prevent data loss when removing the SD/SDHC/SDXC card, it may not be removed during a read or write access [while the SD LED (Fig. 22) is flashing].

To install a card please perform following steps:

1. Insert the SD/SDHC/SDXC card into the SDCARD slot marked "SDCARD" (see Fig. 58 and Fig. 19) on the front side of the KBox C-101.
2. Gently push the card into the slot until it snaps into place. When the card was inserted correctly, the SD LED (Fig. 22) lights up.

Do not act with force when inserting the memory card. If the card is not inserted properly in the guide rails, remove the card from the slot and re-insert it with care.

3. The card is ready for use.

To remove a card, proceed as described below:

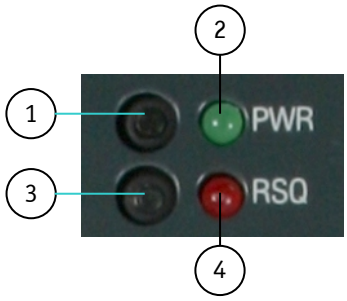
1. Gently push the SD/SDHC/SDXC card until it clicks.
2. Release the card and it will be partially ejected.
3. Pull the card out from the slot.

7.4.7. X110 - RS232 Port

The RS232 interface (X110, Fig. 58, Fig. 60 and Fig. 63) is provided as a 9-pin D-SUB connector. It allows you to connect a serial device to the system.

For pin assignment refer to subsection 20.1.2.

7.4.8. POWER Button and PWR LED



1 Power button (PWR)
2 Power LED (PWR)
3 Rescue button (RSQ)
4 Rescue LED (RSQ)

Fig. 21: Detail - Power button and PWR LED/Rescue button and RSQ LED

The power button (PWR, Fig. 21, pos. 1, Fig. 58, Fig. 60 and Fig. 63) is used to power the KBox C-101 on or off.
By pressing the power button for longer than four seconds a forced system shutdown will be initiated, before the power to the system is turned off.

Caution!
Performing a forced shut down can lead to loss of data or other undesirable effects!

The power LED (marked PWR, Fig. 21, pos. 2, Fig. 58, Fig. 60 and Fig. 63) is on green steady when power is applied to the system.

Prerequisite:
The KBox C-101 has to be connected to an appropriate main power supply (DC).

Even when the system is turned off via the power button there are parts of the system still energized. The unit is only completely disconnected from the DC mains, when the power is removed.

As soon as external power is applied to the main input power connector, X101 (Fig. 18), the KBox C-101 boots up and then starts the operating system and application where available.

To perform an orderly shutdown of the system, press the PWR button and the system shuts down under the control of the operating system.

Once the system has been shut down, it can restarted by pressing the PWR button (assuming that power is still applied to the main input power connector, X101).

7.4.9. RESCUE Button and RSQ LED

The rescue function is not intended for use with a system in an application environment. It is designed to be used if the standard BIOS flash is corrupted, in order to get the system to boot in a defined and safe state for further failure resolution.
Please refer to the chapter 19 "KBox C-101 CPLD Specific Registers".

The RESCUE button (marked RSQ, Fig. 21, pos. 3, Fig. 58, Fig. 60 and Fig. 63) is used to force using the backup flash for system booting.
The RESCUE LED (RSQ, Fig. 58, Fig. 21, pos. 4) blinks red when the backup flash is selected for booting. The backup flash contains a cloned BIOS (uEFI) version. In the event the system does not properly start-up or gets hung-up and restarting (cold booting) the system does not help, it is possible to switch to the backup boot flash and then restart the system. To do this, press the RSQ button for more than five seconds, whether or not the system is running it will now start-up using the backup flash for booting.

To revert to using the standard boot flash, the system must be cold started using the PWR button or remove power completely from the system and then reapply.

7.4.10. Status and General Purpose LEDs

After power is applied and the KBox C-101 performs the boot procedure, the LEDs show the POST code. In case of a boot failure within the uEFI the last post code is displayed. When the boot phase is passed without errors, the LEDs change to their status and general purpose function.

The following table provides information concerning these LEDs (Fig. 58 and Fig. 22).

Status and General Purpose LEDs			
Designator	**Function**	**Color**	**Description**
THERM	Thermal	Red blinking	The system turns off due to over temperature
DRIVE	Drives (SSD/HDD)	Green	SSD/HDD active
SD	SD Card	Green	SD card active
WD	Watchdog	Red blinking	Watchdog timeout occurred
GP1	General Purpose 1	Red/Green/Orange	User general purpose 1
GP2	General Purpose 2	Red/Green/Orange	User general purpose 2
GP3	General Purpose 3	Red/Green/Orange	User general purpose 3
GP4	General Purpose 4	Red/Green/Orange	User general purpose 4

Fig. 22: Detail - Status and General Purpose LEDs

7.4.11. X205 - Optional FIELDBUS Interface

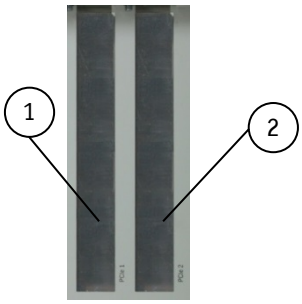
The optional interface (FIELDBUS) on the front side of the KBox C-101 must be ordered separately. To add a FIELDBUS interface to the system, the second mPCIe socket (on the bottom of the baseboard), will be used. This connection can be implemented at factory only.

Fig. 23: X205 – Location for the optional FIELDBUS interface

7.4.12. PCI/PCIe Expansion Slot 1 and Slot 2

The KBox C-101 provides on the front side up to two slots (see "PCIe 1" and "PCIe 2" in Fig. 58 for KBox C-101-2 and "PCIe 1" for KBox C-101-1 in Fig. 60) for system expansion with PCI/PCIe expansion cards via corresponding riser cards.

To access the corresponding riser card sockets, in order to install or remove PCI/PCIe expansion cards (refer to the subsection 9.3.4 "Riser Cards Expansion Sockets for PCI/PCIe Cards"), you have to remove the top side access cover. For a better accessibility of the expansion sockets you should remove the right side access cover (Fig. 30 and Fig. 28, pos. 1 and pos. 3) also.



1 PCIe 1 slot
2 PCIe 2 slot

Fig. 24: PCIe 1 and PCIe 2 slots (shown as detail of a KBox C-101-2)

Please observe that:

KBox C-101-2: supports up to:
2x PCIe x4/PCIe x1 expansion cards **or**
1x PCIe x4/PCIe x1 and 1x PCI (32 bit) expansion cards.
For system configuration refer to Fig. 58, Fig. 59 and for expansion cards installation refer to the subsection 9.3.5 "Installing/Removing the PCI/PCIe Expansion Cards".

KBox C-101-1: supports 1x PCIe x4/PCIe x1 expansion card.
For system configuration refer to Fig. 60, Fig. 61 and for expansion card installation the subsection 15.1.1 "PCIe Expansion Slot 1".

KBox C-101-0: can't be equipped with PCI/PCIe expansion cards. Refer to Fig. 63 and Fig. 64.

Refer also to the area marked "C" in the section 7.4.

7.4.13. Internal or Removable 2.5" SATA HDDs/SSDs

Depending on the ordered system configuration, your KBox C-101-2 can be equipped with up two drive bays for 2.5" removable SATA HDDs/SSDs (refer to Fig. 58, Fig. 59 and Fig. 25) or one internal mounting frame for 2x 2.5" SATA HDDs/SSDs.

The internal 2.5" HDDs/SSDs are not accessible from the outside. The internal SATA HDDs/SSDs are installed (always factory installed) into the system by use of a mounting frame.

The 2.5" drive bays (DRIVE 1 and DRIVE 2) for removable HDDs/SSDs are accessible from the front side (Fig. 58) of the system (refer to Fig. 25, Fig. 26 and Fig. 27).

The drives support following drive speeds:

- ❑ DRIVE 1: up to SATA 6 Gb/s.
- ❑ DRIVE 2: up to SATA 3 Gb/s.

	If the KBox C-101-2 configuration with internal 2.5" SATA HDDs/SSDs was ordered, the "DRIVE 1" and "DRIVE 2" for removable SATA HDDs/SSDs are not available (refer to Fig. 9). If the KBox C-101-2 configuration with removable 2.5" SATA HDDs/SSDs was ordered, no installation of any internal SATA HDD/SSD (with mounting frame) is possible. Refer also to the area marked "D" in the section 7.4.

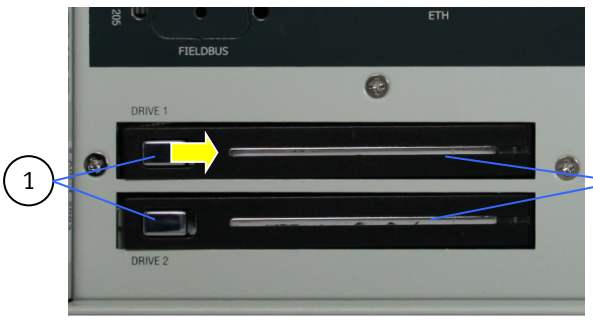


Fig. 25: Drive 1 and Drive 2 for removable 2.5" SATA HDD/SSD (option); closed drive bays

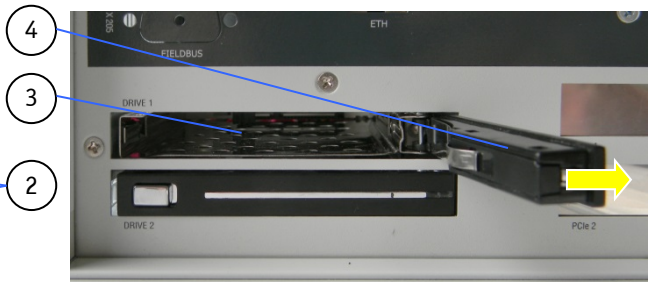


Fig. 26: Drive bay 1 with opened drive bay cover

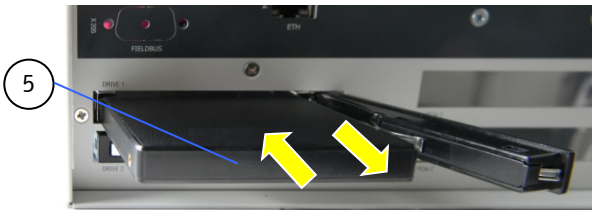


Fig. 27: Inserting/removing a 2.5" removable SSD

This SATA interface supports hot-swapping.

To prevent data loss, don't remove the HDD during read/write activity [while the "DRIVE LED" (Fig. 22) is flashing green].

Legend for Fig. 25, Fig. 26 **and** Fig. 27:

1 Slide button to release the drive bay cover
2 Cover of the drive bay
3 Drive bay for 2.5" removable SATA HDD/SSD
4 Opened drive bay cover
5 Inserting or removing a 2.5" removable SATA HDD/SSD

	Please observe that the KBox C-101-1 system configuration can be equipped with only one internal or removable 2.5" SATA HDD/SSD. Refer to the chapter 15 "KBox C-101-1 Variant" and the subsection 15.1.2 "Internal or Removable 2.5" SATA HDD/SSD". The KBox C-101-0 can be equipped with only one internal 2.5" SATA HDD/SSD. Refer to the chapter 16 "KBox C-101-0 Variant" and the subsection 16.1.1 "Internal 2.5" SATA Drive". Refer also to the area marked "D" in the section 7.4.

7.4.13.1. Installing/Removing the removable HDD/SSD

To install/remove a removable drive, please perform the following steps:

1. Slide the button (Fig. 25, pos. 1) of the drive cover (Fig. 25, pos. 2) to the right (this movement is upwards, on the system in vertical position) and release it. The drive bay cover will spring up.
2. Pull the drive cover up.
3. Insert/remove the drive into/out from the bay receptacle.
4. Close the cover.

7.5. Left and Right Side View

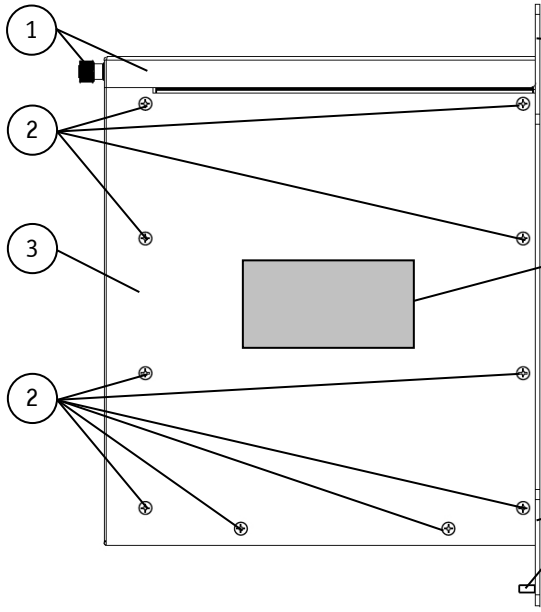


Fig. 28: Right side of the KBox C-101 system

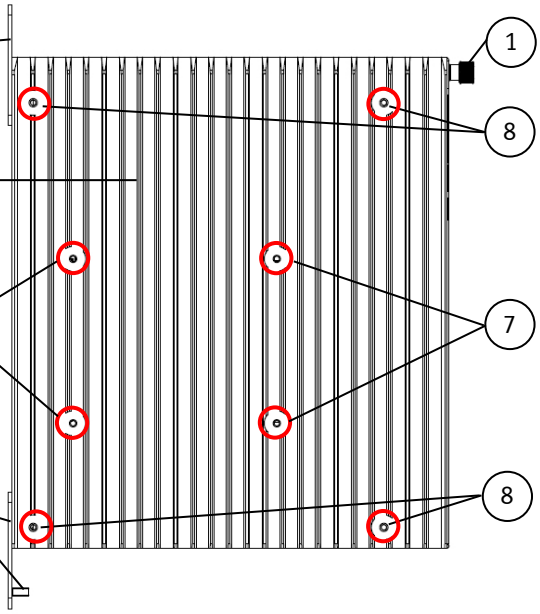


Fig. 29: Left side of the KBox C-101 system

Legend for Fig. 28, Fig. 29, Fig. 30 **and** Fig. 31:

1 Top side access cover with knurled screws
2 10x screws that secure the right side access cover
3 Right side access cover
4 Upper mounting bracket with key holes
5 Lower mounting bracket with M4 ground stud and key holes
6 Cooling fins of the chassis
7 Screws that secure the COMExpress® module
8 Screws that secure the cooling fins to the chassis
9 Type label
10 Hole for further system fan tray extension
11 Air intake openings on the bottom cover
12 Air exhaust openings on the top cover

Please do not remove the red marked screws (see Fig. 29, pos. 7 and pos. 8).

7.6. Top and Bottom Side View

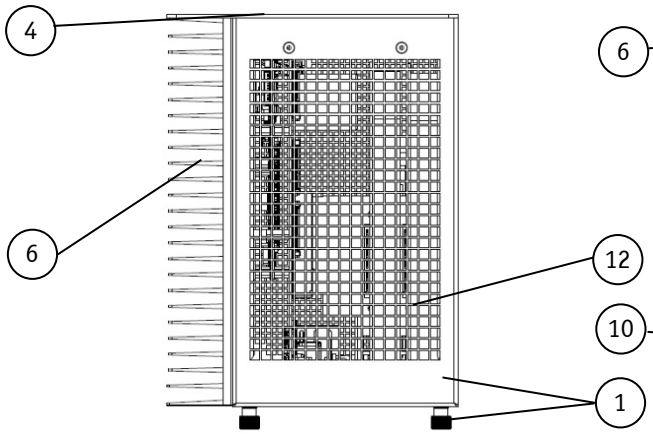


Fig. 30: Top side of the KBox C-101 system

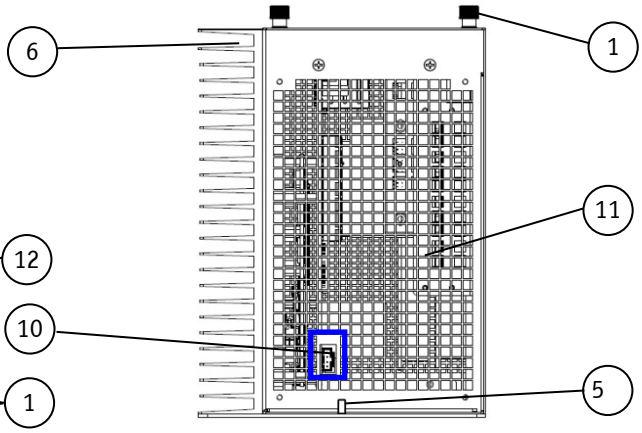


Fig. 31: Bottom side of the KBox C-101 system

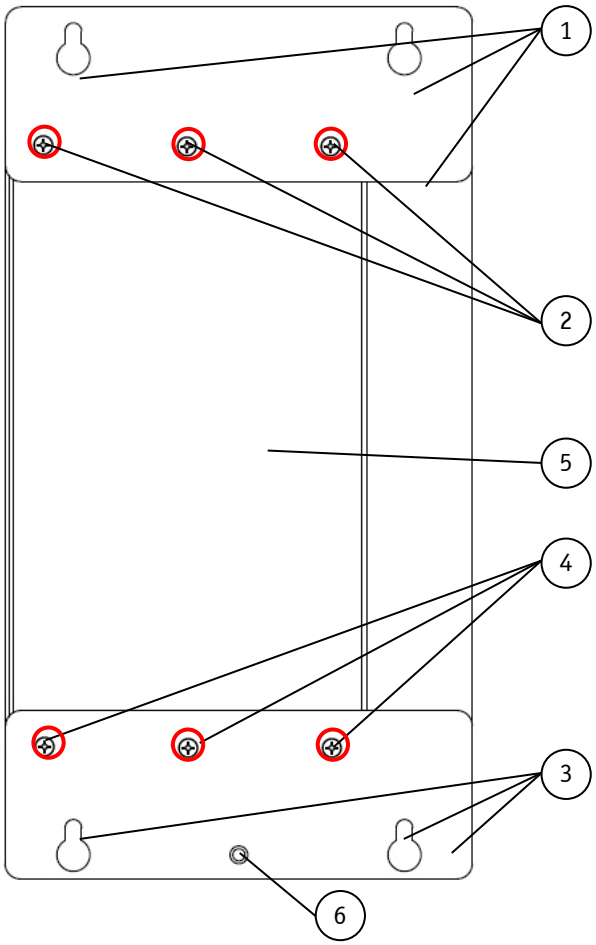
When powering on the KBox C-101, make sure that the air intake and exhaust openings are not obstructed. To provide sufficient heat dissipation for the cooling of the KBox C-101 system, never cover the cooling fins of the chassis. Do not place any objects onto the device.

7.7. Rear Side View

The KBox C-101 is designed for wall mounting, in vertical position inside of a control cabinet.

☞ Please do not remove the red marked screws (see Fig. 32, pos. 2 and pos. 4).

Please observe the mounting instructions included in the chapter 11 "Installation Instructions", and the outline dimensions in the subsection 18.1 "Mechanical Specifications".
For the dimensions of the KBox C-101 versions with the optional fan expansion, refer to the subsection 18.1.2 "Mechanical Specifications of the KBox C-101-2 with Fan Tray Option" and 18.1.4 "Mechanical Specifications of the KBox C-101-1 with Fan Tray Option".



1 Key holes on the upper mounting bracket
2 Screws that secure the upper mounting bracket of the KBox C-101-2 and KBox C-101-1 (KBox C-101-0 has only 2 screws)
3 Key holes on the lower mounting bracket
4 Screws that secure the lower mounting bracket of the KBox C-101-2 and KBox C-101-1 (KBox C-101-0 has only 2 screws)
5 Chassis rear
6 Functional Earth stud

Fig. 32: Rear side of the KBox C-101-2 system

7.8. Functional Earth Stud

There is an M4 functional earth terminal on the lower mounting bracket of the KBox C-101 (Fig. 32, pos. 6). This terminal may be connected as required.

The KBox C-101 with the stud marked with a "Functional Earth" symbol (Fig. 32) has to be grounded to an appropriate "common earth" connection point.

8. System Extensions

Optional your KBox C-101 can be equipped by factory only, with following ports and additional components:

- ❑ Serial port RS232 or RS422 via an adapter module
- ❑ CAN port: via an adapter module
- ❑ DVI-D or DisplayPort: via corresponding adapter module
- ❑ Fan Tray: an additional component connected to the KBox C-101-2 and KBox C-1o1-1

You have to order these components separately, in order to extend your KBox C-101 at the factory.
Example of system configuration, see below:

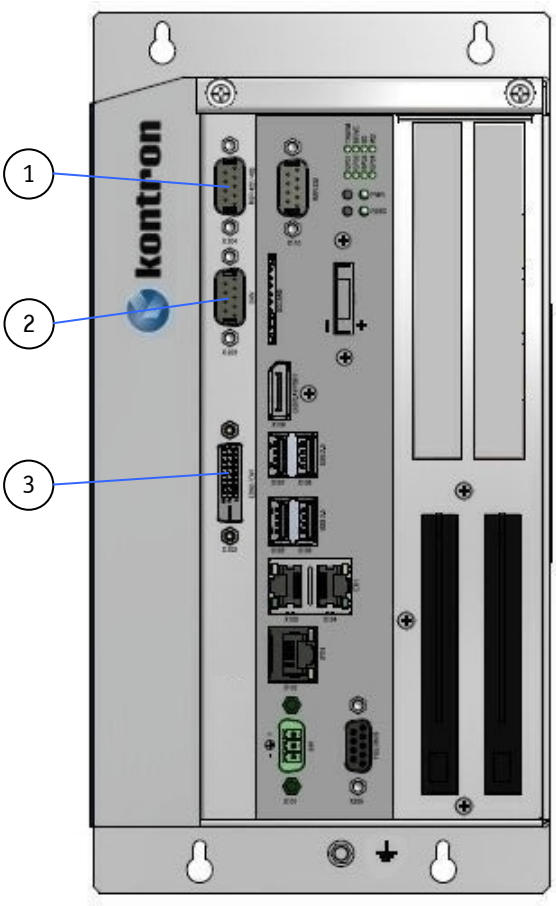


Fig. 33: KBox C-101-2 shown with optional interfaces and with removable drive bays

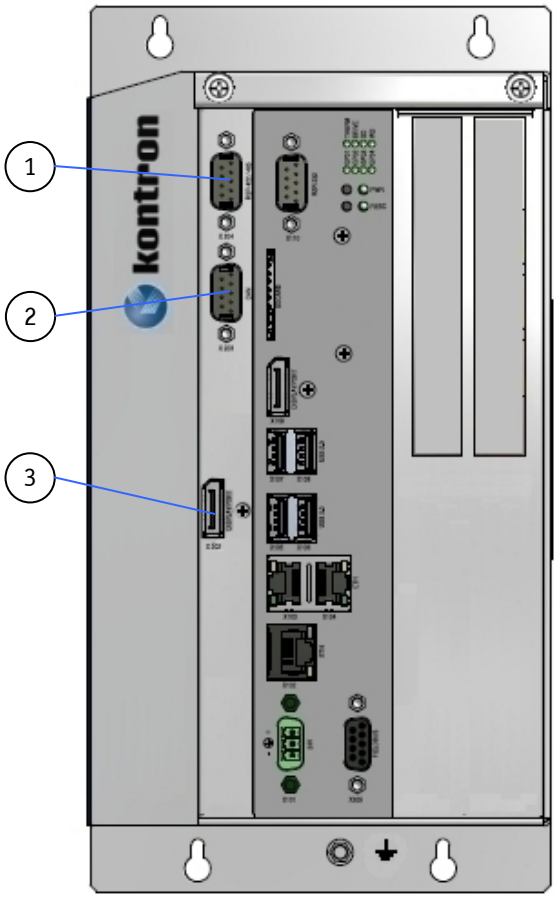


Fig. 34: KBox C-101-2 shown with optional interfaces and without removable drive bays

Legend for Fig. 33 **and** Fig. 34**:**

1 Serial port RS232/RS422

2 CAN port

3 DVI-D (Single Link) port or DisplayPort (DP 2)
(depending on the ordered option)

8.1. (X204) - Serial Port RS232/RS422

This port can be only factory installed and configured.
When you order the KBox C-101 with this extended interface via RS232/422 adapter module, you have to specify in your ordering:

- ❑ the needed configuration of this port as RS232 or RS422 and
- ❑ for RS422 configuration: if the onboard termination resistor (120Ω) should be enabled or disabled.

Your KBox C-101 can be extended, via an adapter module, with an additional serial interface RS232/RS422. This serial port (Fig. 33, Fig. 34, pos. 1) is available as 9-pin D-SUB connector (male), marked as "SERIAL" on the front side of the system. It must be factory configured as RS232 or RS422 corresponding your ordered port configuration. The serial port will be configured via an on-board DIP switch (SW1) for RS232 or RS422 serial communication.

Your system order with RS422 port must also contain the specification about the termination resistor (120Ω). If your application requires the termination resistor, it must be enabled at factory only. The corresponding DIP switch is not accessible for end user. For pin assignment refer to subsection 20.2.3.

8.2. (X203) - CAN Port

Your KBox C-101 can be extended via an adapter module with a CAN port, that allows you CAN Bus communication. The optional CAN port (Fig. 33, Fig. 34, pos. 2) is implemented as a sub-D 9 pin connector (male). This port is galvanically isolated (500V).
For pin assignment refer to the section 20.2.4.

If a termination resistor (120Ω) is required, you have to make a connection (bridge) between pin 1 and 2, respectively pin 7 and pin 8, in order to enable the onboard termination resistor (120Ω).

8.3. (X202) - DVI-D Interface Connector or DP 2 DisplayPort

Your KBox C-101 can optionally be extended with a DVI-D interface or a second DisplayPort (DP 2).

Only one of these two interfaces (DVI-D and DP 2) can be ordered as optional extension of your KBox C-101 system.

The DVI-D port (Single Link) (Fig. 33, pos. 3) marked "DVI" supports digital connections. Digital devices can be connected directly to this interface of the KBox C-101.
For pin assignment refer to subsection 20.2.1.

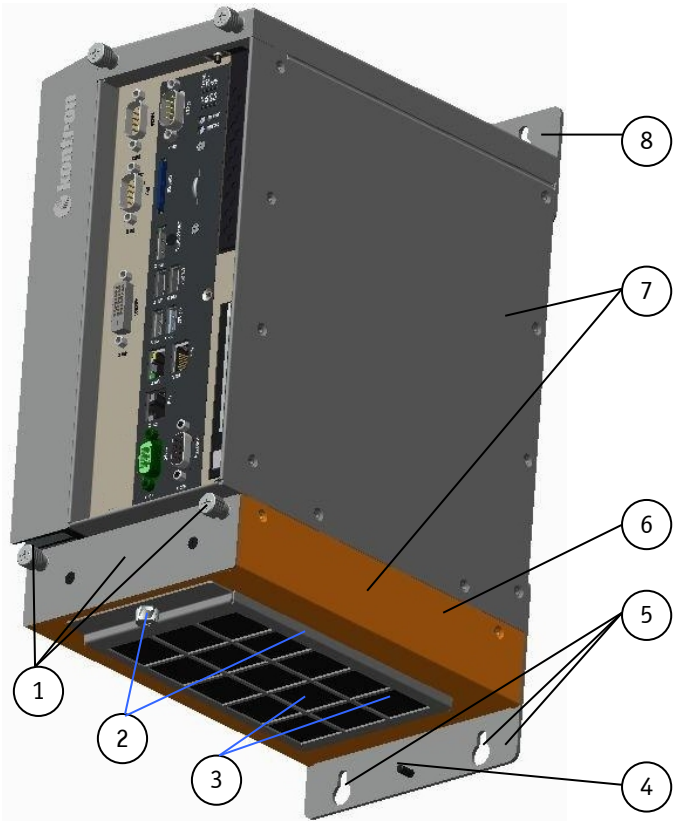
The DP 2 port is a DisplayPort compliant interface realised using a standard DisplayPort connector. An external (digital) display can be connected to the DisplayPort connector (DP 2) (Fig. 34, pos. 3).
For pin assignment refer to subsection 20.1.3.

8.4. Optional Versions with Fan Tray - KBox C-101-2/-1

By using a fan tray, the KBox C-101-2/-1 can be operated in a control cabinet with extended ambient temperature; refer to the specified values in the section 18.2 "Environmental Specifications" and chapter 10 "Thermal Considerations".

	All chapters of this manual are valid for the KBox C-101-2 and KBox C-101-1 with fan tray under consideration of the mechanical differences and the description in this section. Please refer also to the subsection 18.1.2 "Mechanical Specifications of the KBox C-101-2 with Fan Tray Option", and subsection 18.1.4 "Mechanical Specifications of the KBox C-101-1 with Fan Tray Option".

The KBox C-101 with fan tray chassis extension is designed to provide a better airflow through the system chassis. The KBox C-101-2/-1 can be only factory equipped with the optional fan tray (Fig. 35). The fan tray slot is external mounted to the bottom side of the KBox C-101-2/-1 chassis and comprises a fan tray (Fig. 35, pos. 1) with one fan as well as the air filter.



1 Fan tray with knurled screws
2 Air filter holder with knurled screws
3 Air filter
4 Functional earth stud
5 Lower mounting bracket with key holes
6 Fan tray slot with installed fan tray
7 KBox C-101 variant with optional fan tray
8 Upper mounting bracket with key holes

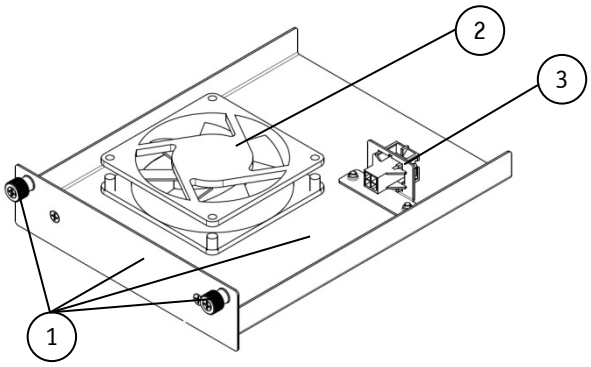
Fig. 35: KBox C-101-1 equipped with the optional fan tray

The fan is integrated in a user-friendly, replaceable fan tray (hot-swapping). The fan tray is designed to be inserted into the fan tray slot (Fig. 35, pos. 6) on the bottom side of the KBox C-101-2/-1. The fan tray simplifies the installation and removal of this component, even during operation.
The fan rotation speed is temperature controlled in dependence on the CPU temperature. Thus, a reliable air circulation for optimal active cooling of the KBox C-101-2/-1 is ensured.
The temperature conditions of the system (depending on the environmental temperature and the system load) are detected by the CPU temperature sensor.
In order to ensure a clean air circulation through the system, the fan tray slot provides an installed air filter (Fig. 35, pos. 3).
The air filter, which protects your system against dust and dirt, is washable and may be replaced during operation; refer to subsection 13.4 "Cleaning the Air Filter".

8.4.1. Fan Tray (only for KBox C-101-1 and KBox C-101-2)

Important Instructions!

The fan tray can be replaced during operation. This should only be carried-out by qualified personnel, aware of the associated dangers (see subsection 13.3 "Replacing the Fan Tray").



1 Fan tray with knurled screws

2 Fan (temperature controlled)

3 Connector for fan power and control

Fig. 36: Fan tray components of the KBox C-101-1/-2
(cable connections between fan and fan connector are included in this assembly)

9. Accessing Internal Components

This chapter contains important information that you must read before accessing the internal components. You must follow these procedures properly when installing, removing or handling any system component.

It is recommended to expand your system with additional PCI/PCIe/PCIe Mini cards before it is installed into an industrial control cabinet. Please consider following instructions when you install or remove expansion cards.

Before installing/removing an expansion card, please pay attention to the following information:

Please observe the "General Safety Instructions for IT-Equipment" provided with the system (refer also to the chapter 4) and the installation instructions contained in this manual. The KBox C-101 system shall be mounted into a control cabinet.

Only personnel with appropriate qualifications, trainings and authorization are permitted to install and work with the KBox C-101 system.

The installation/removal of HDDs/SSDs and/or expansion cards may only be performed by a qualified person, according to the description in this manual.

Before removing the cover of the device, make sure that the device is powered off and disconnected from the power supply.

Before you upgrade the KBox C-101 with expansion cards, pay attention to the power specifications in chapter 18 "Technical Specifications" and make sure that the power consumption of the expansion cards does not exceed 15 W per card.

Please follow the safety instructions for components that are sensitive to electrostatic discharge (ESD). Failure to observe this warning notice may result in damage to the device or/and internal components.

Please pay attention to the manufacturer's instructions before installing/removing an expansion card.

9.1. Top Cover

	The pictures in this section correspond to a KBox C-101-2 system. The cover description can be applied to all system variants, under consideration of the different mechanical specifications of the KBox C-101; refer to the section 18.1 "Mechanical Specifications".

When used as intended the KBox C-101 is to operate only in closed condition.
Only when the right side cover is fixed with the screws (Fig. 28, pos. 2) and top cover is properly installed and secured with the knurled screws (Fig. 58, pos. 2) on the front side, it is ensured that the user doesn't have access to the internal components of the KBox C-101 during operation.

The cover will be fixed to the chassis using the centring bracket at the rear side of the cover (Fig. 37, pos. 3) and the fixing bracket with captive knurled screws at the front side of the cover (Fig. 37, pos. 5).

When inserting the cover, make sure that:

- ❑ At the rear: the centring bracket (Fig. 37, pos. 3) is inserted properly into the corresponding cover retaining bracket of the chassis (Fig. 42, pos. 13).
- ❑ At the front side: the fixing bracket with captive knurled screws of the cover (Fig. 37, pos. 5), is matching properly over the cover retaining bracket on the front side (Fig. 42, pos. 1).

The fixing bracket with captive knurled screws (Fig. 37, pos. 5) secures the top cover on the front side (Fig. 58, pos. 2).

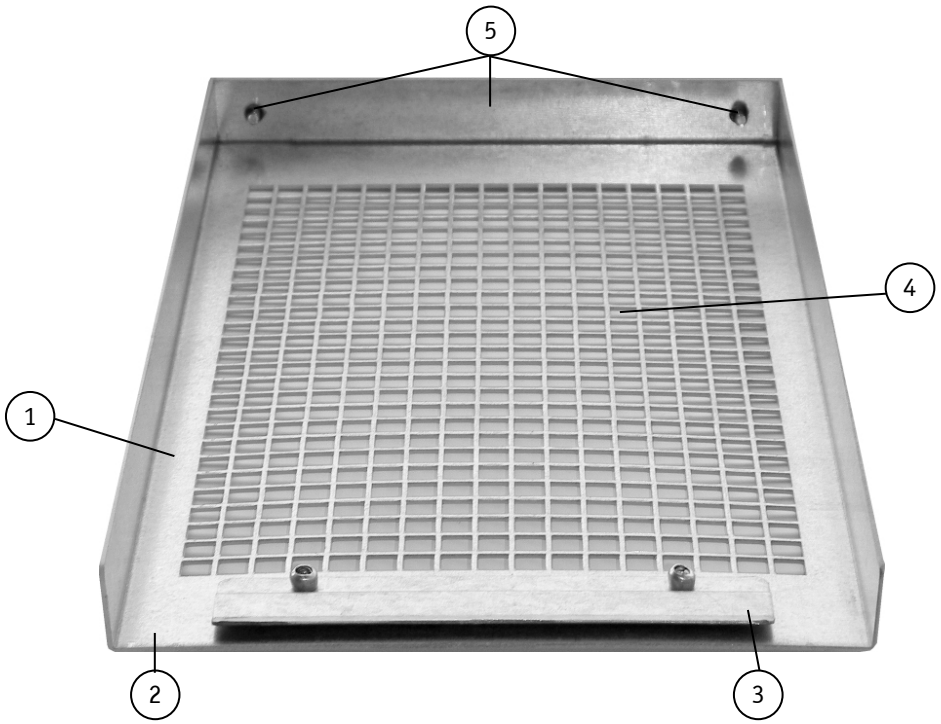


Fig. 37: Inside of the top cover with centring and fixing brackets

1 Inside of the top cover
2 Rear part of the top cover
3 Centring bracket (on the rear side)
4 Air exhaust openings
5 Fixing bracket with knurled screws on the front side

9.2. Opening and Closing the KBox C-101

	The pictures in this section correspond to a KBox C-101-2 system. The "opening/closing" procedure description can be applied to all system variants, under consideration of the different mechanical specifications of the KBox C-101; refer to the section 18.1 "Mechanical Specifications".

For opening/closing the KBox C-101, please perform the following steps:

The system must be powered off and disconnected from the main power supply, before you attempt to open the KBox C-101. Ensure that you have a clean, flat and ESD-safe surface to work on. Also disconnect all peripheral devices from the KBox C-101. Please observe the instructions contained in the chapter 11 "Installation Instructions".

1. Close all applications. Shut down the system properly and disconnect the connection to the power source. Disconnect all peripherals.
2. The KBox C-101 should lay on a flat, clean surface with the top side facing upwards.
3. Loosen the knurled screws, which secure the top cover on the front of the system (see Fig. 58/Fig. 60/Fig. 63, pos. 2 and Fig. 38).
4. Pull the cover out a little bit, as shown in Fig. 38, to release the cover centering and fixing brackets.

Fig. 38: This movement allows you to remove the centring and fixing bracket of the top cover (detail of the KBox C-101-2)

5. Lift the top cover up (on the front edge) and remove it (Fig. 39). Now you have access to the internal sockets (PCI/PCIe/Mini PCIe and mSATA) or to the corresponding cards/devices, in order to install or remove internal hardware components.

Fig. 39: Removing the cover (detail of the KBox C-101-2)

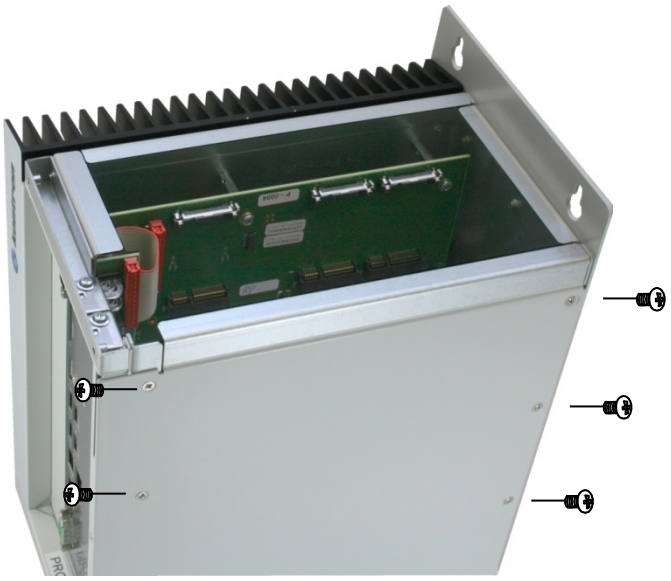


Fig. 40: KBox C-101-2 - removing the right side cover

6. For a better accessibility of the internal sockets (PCI/PCIe/Mini PCIe and mSATA SSD), you may also remove the right side cover of the KBox C-101 (Fig. 41). Loosen the externally accessible fastening screws (Fig. 28, pos. 2) that secure the right side cover (Fig. 40 and Fig. 28, pos. 3). Pull the right side cover out, to detach it from the sideways mounted bolts. Put the right side cover and the screws aside for later use.

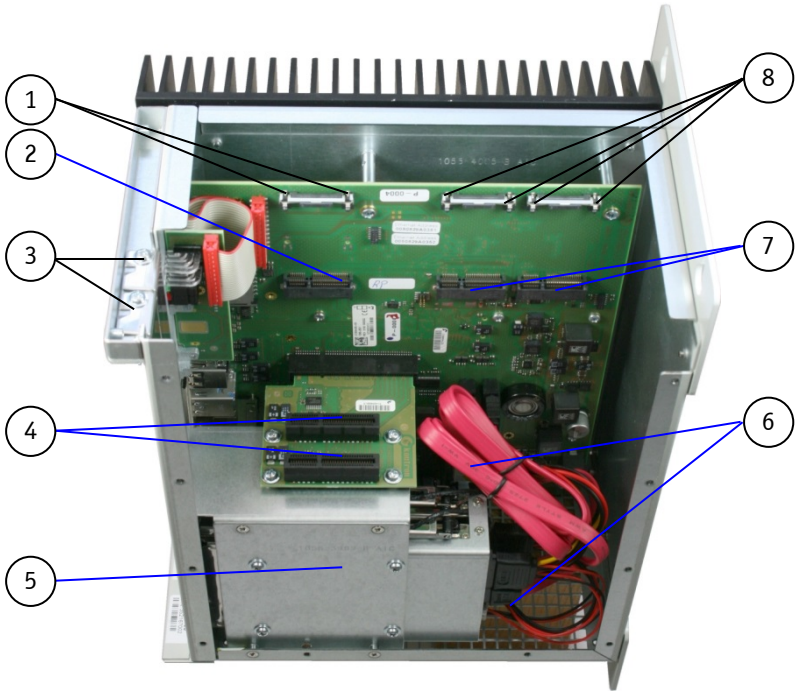


Fig. 41: KBox C-101-2 without top and right side cover(shown with a PCIe riser card)

1 Fixing clips to secure the PCIe Mini card

2 1x Mini PCIe socket for PCIe Mini card

3 Screws to fix the PCIe slot bracket or the I/O bracket of the PCIe card

4 Riser card with 2x PCIe x4 sockets

5 Mounting frame for up to two removable 2.5" SATA HDD/SSD

6 SATA cable connections (power and data)

7 2x mSATA sockets

8 Fixing clips to secure the 2x mSATA SSDs

9.3. Internal View

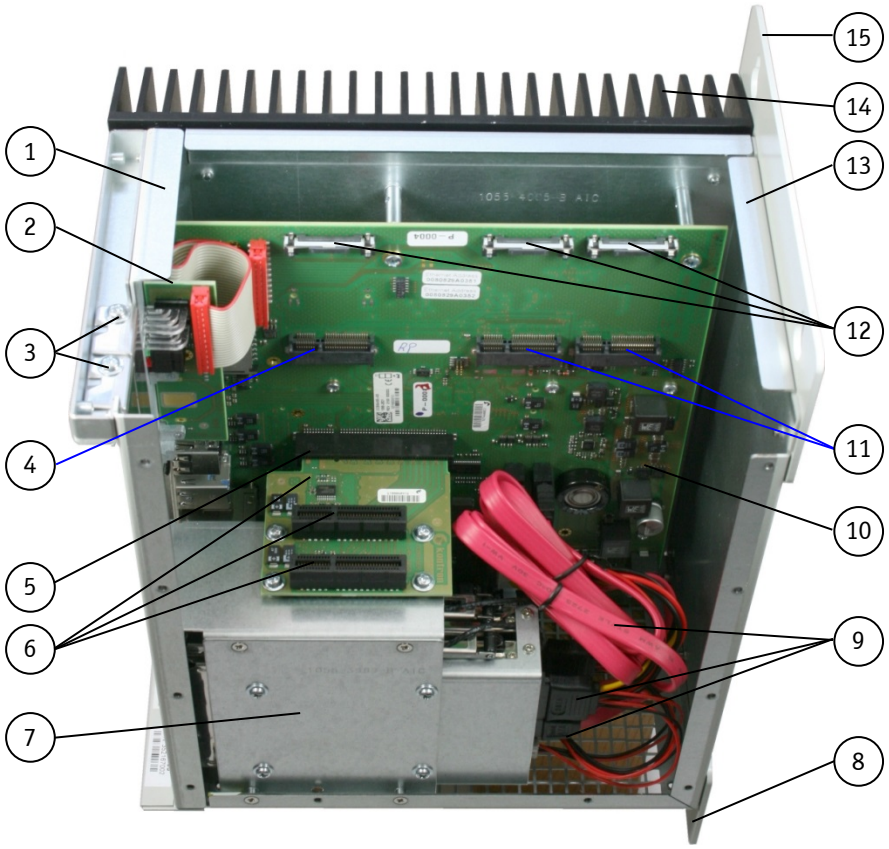


Fig. 42: KBox C-101-2 - internal view (shown with a PCIe riser card and removable HDD/SSD drive bay)

1 Cover retaining bracket on the front side

2 LED indicators circuit

3 Screws that secure the PCIe slot brackets

4 1x Mini PCIe socket for PCIe Mini card (please observe the note below)

5 PCI x8 socket of the baseboard

6 Riser card with 2x PCIe x4 sockets

7 Mounting frame for 2.5" drive bays of the removable HDDs/SSDs

8 Lower mounting bracket with key holes

9 SATA cable connections (power and data)

10 Baseboard

11 2x mSATA sockets

12 Mechanical fixing assemblies for:
2x 2.5" mSATA SSD and 1x PCIe Mini card (two fixing bolts for each mSATA SSD and PCIe Mini card) (please observe the note below)

13 Cover retaining bracket on the rear side

14 Cooling fins

15 Upper mounting bracket with key holes

The KBox C-101 provides two internal Mini PCIe sockets. You can see one of them in Fig. 42, pos. 4. The second Mini PCIe socket is on the bottom side of the baseboard and can be only at factory equipped with an expansion card.

9.3.1. Integrated COMe Module

Depending on the ordered system configuration, your KBox C-101 accommodates a baseboard with either a COMe-bHL6 i5-4402E or a COMe-bHL6 i7-4700EQ module.

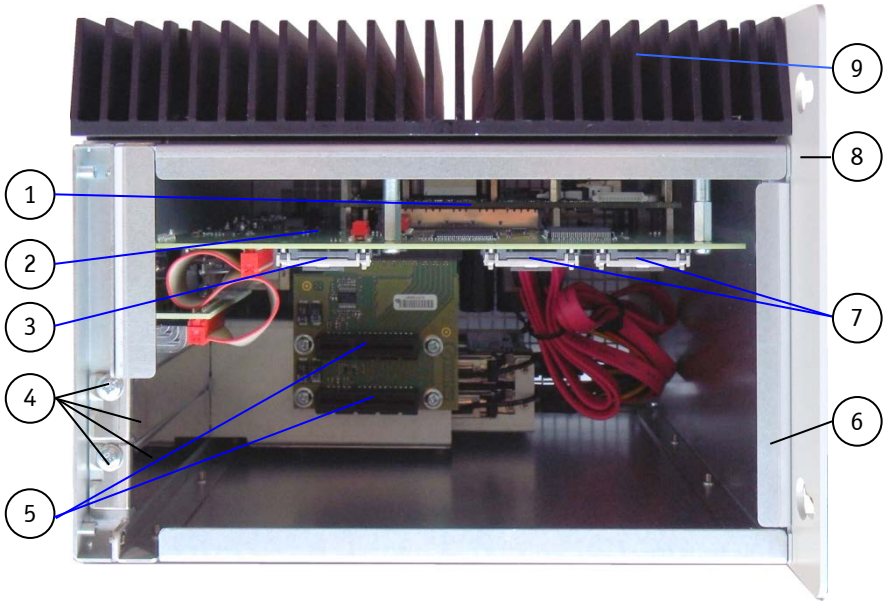


Fig. 43: KBox C-101-2 - internal view with COMExpress® module and with PCIe riser card

1 COM Express module
2 Baseboard
3 Mechanical fixing assemblies for 1x PCIe Mini card (two fixing clips for each PCIe Mini card)
4 Screws that secure the PCIe slot brackets
5 Riser card with 2x PCIe x4 sockets
6 Cover retaining plate on the rear side
7 Mechanical fixing assemblies for 2x 2.5" mSATA SSD (two fixing clips for each mSATA SSD)
8 Upper mounting bracket with key holes
9 Cooling fins

☞ Refer to the information and technical data included in the user manual of the installed COMe-BHL6 2002E, COMe-bHL6 i5-4402E-or a COMe-bHL6 i7-4700EQ Module.

The user manual of the installed COMe Module can be downloaded from our web page www.kontron.com . Search for the name of the installed module.

9.3.2. mSATA Socket

Depending on the system configuration ordered your KBox C-101 can be extended with up to two mSATA SSDs.

For installation/removing of the mSATA SSD refer to the subsection 9.3.7 "Installing/Removing an mSATA SSD".

9.3.3. Expansion Socket for PCIe Mini Cards

Depending on the system configuration ordered, your KBox C-101 can be extended with up to two PCIe Mini cards.

The KBox C-101 provides two internal Mini PCIe sockets for PCIe Mini cards. One of them is internally accessible (Fig. 42, pos. 4). The second Mini PCIe socket is on the bottom side of the baseboard and can be only at factory equipped with an expansion card.

For installation/removing of the PCIe Mini card (Fig. 42, pos. 4), please refer to the subsection 9.3.6 "Installing/Removing the PCIe Mini Card".

9.3.4. Riser Cards Expansion Sockets for PCI/PCIe Cards

Depending on the system configuration ordered, your KBox C-101 can be extended with 1x PCI (32 bit) card and up to two PCIe x4/PCIe x1 cards (full-height, half-length form factor) via corresponding riser cards.

For installation/removing of PCI/PICIe cards into/from the corresponding socket
(Fig. 44, pos. 5 and pos. 6) / (Fig. 45, pos. 5 and pos. 8) and (Fig. 62, pos. 12).
Please refer to the subsection 9.3.5 "Installing/Removing the PCI/PCIe Expansion Cards".

To expand your system with expansion cards, please observe the power consumption specified in the chapter 18 "Technical Specifications".
The power consumption of each expansion card does not exceed 15 W.

Please observe that:

KBox C-101-2: supports up to:
2x PCIe x4/PCIe x1 expansion cards **or**
1x PCIe x4/PCIe x1 and 1x PCI (32 bit) expansion cards.
For system configuration refer to Fig. 58, Fig. 59 and for expansion cards installation refer to the subsection 9.3.5 "Installing/Removing the PCI/PCIe Expansion Cards".

KBox C-101-1: supports 1x PCIe x4/PCIe x1 expansion card.
For system configuration refer to Fig. 60, Fig. 61 and for expansion card installation refer to the subsection 15.1.1 "PCIe Expansion Slot 1".

KBox C-101-0: can't be equipped with PCI/PCIe expansion cards.

Refer also to the area marked "C" in the section 7.4.

9.3.5. Installing/Removing the PCI/PCIe Expansion Cards (for KBox C-101-2/-1 only)

The PCI/PCIe expansion cards can be installed into the slots on the front side of the system (Fig. 58/Fig. 60). The slots are marked with "PCIe 1" and "PCIe 2". It is recommended to expand your KBox C-101 with PCI/PCIe cards before it is installed on a wall into a control cabinet.

1. Close all applications; shut down the system properly and disconnect the connection to the power source. Disconnect all peripherals.
2. To have access to the PCI/PCIe x4 sockets you have to open the KBox C-101-2/-1 as described in the section 9.2 "Opening and Closing the KBox C-101" (step 1-6).
3. To remove/install an expansion card, you have to remove the corresponding card/slot bracket (refer to Fig. 58/Fig. 60 and Fig. 44/Fig. 45). Loosen the corresponding fastening screw on the internal side, which secures the slot/card bracket and remove it. Retain the screw for later use (refer to Fig. 44/Fig. 45, pos. 2).

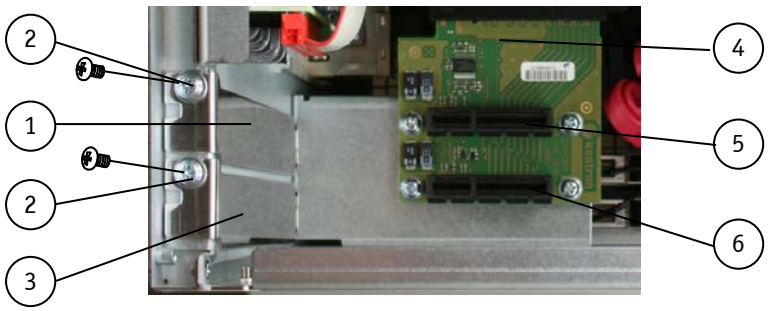


Fig. 44: Detail of the KBox C-101-2 with PCIe riser card with 2x PCIe x4 sockets

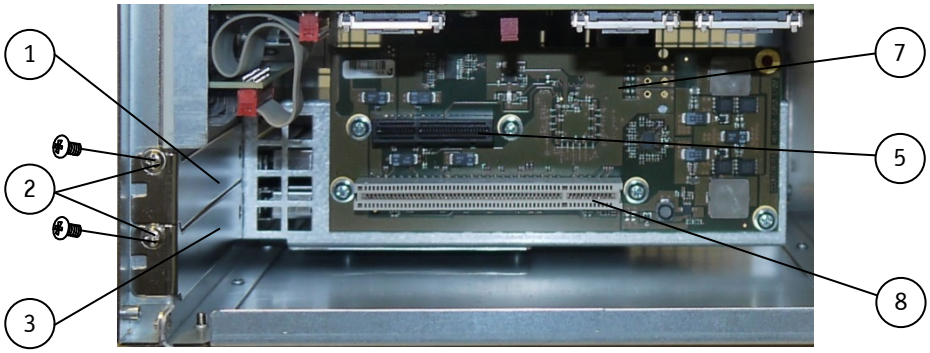


Fig. 45: Detail of the KBox C-101-2 with PCI-PCIe riser card with 1x PCI (32 bit) and 1x PCIe x4 sockets

Legend for Fig. 44 **and** Fig. 45:

1	Slot bracket for the for the PCIe 1 expansion slot	5	Free PCIe x4 socket (for PCIe 1 slot)
2	Screws to secure the expansion slot/cards brackets	6	Free PCIe x4 socket (for PCIe 2 slot)
3	Slot bracket for the for the PCIe 2 expansion slot	7	Riser card with 1x PCI and 1x PCIe x4 expansion sockets
4	Riser card with 2x PCIe x4 expansion sockets	8	Free 1x PCI (32 bit) (for PCIe 2 slot)

4. Insert/remove the expansion card into/from the corresponding PCI/PCIe x4 socket of the corresponding riser card (Fig. 44, pos. 5, pos. 6 or Fig. 45, pos. 5, pos. 8).
5. If you have removed an expansion card, re-insert the slot bracket.
6. Secure the card or slot bracket to the chassis with the retained fastening screw.
7. In order to close the KBox C-101-2, proceed in reverse order (step 6 to 1 in the section 9.2).

9.3.6. Installing/Removing the PCIe Mini Card

To install a PCIe mini card please proceed according to the steps described:

1. Close all applications; shut down the system properly and disconnect the connection to the power source. Disconnect all peripherals.
2. Open the device as described in the section 9.2 "Opening and Closing the KBox C-101" (step 1-6).
3. Locate the PCIe Mini card socket and the corresponding fixing clips (Fig. 41, pos. 1).
4. Insert the PCIe Mini card into the socket (Fig. 41, pos. 2) at an angle of approx. 45° and push it down until the fixing holes of the card are aligned with the fixing clips.
5. Press the PCIe Mini card down (on the side with the fixing holes) until the card snaps in the fixing clips.
6. In order to close the KBox C-101, proceed in reverse order (step 6 to 1 of the section 9.2).

To remove a PCIe Mini card please proceed according to the steps described:

1. Close all applications; shut down the system properly and disconnect the connection to the power source. Disconnect all peripherals.
2. Open the device as described in the subsection 9.2 "Opening and Closing the KBox C-101" (step 1-6).
3. Locate the PCIe Mini card installed into your system.
4. Slide outwards the fixing clips in order to release the PCIe Mini card. It will spring up at an angle of approx. 45° on the fixing clips side.
5. Gently pull the PCIe Mini card out.
6. In order to close the KBox C-101, proceed in reverse order (step 6 to 1 of the section 9.2).

9.3.7. Installing/Removing an mSATA SSD

To install an mSATA SSD please proceed according to the steps described:

1. Close all applications; shut down the system properly and disconnect the connection to the power source. Disconnect all peripherals.
2. Open the device as described in the subsection 9.2 "Opening and Closing the KBox C-101" (step 1-6).
3. Locate the mSATA sockets and the corresponding fixing clips. (Fig. 41 and 8).
4. Insert the mSATA SSD card into the corresponding socket (Fig. 41, pos. 7) at an angle of approx. 45° and push it down until the fixing holes of the card are aligned with the fixing clips.
5. Press the mSATA SSD down (on the side with the fixing holes) until the mSATA SSD snaps in the fixing clips.
6. In order to close the KBox C-101, proceed in reverse order (step 6 to 1 of the section 9.2).

To remove an mSATA SSD please proceed according to the steps described:

1. Close all applications; shut down the system properly and disconnect the connection to the power source. Disconnect all peripherals.
2. Open the device as described in the subsection 9.2 "Opening and Closing the KBox C-101" (step 1-6).
3. Locate the mSATA SSD card installed into your system.
4. Slide outwards the fixing clips in order to release the mSATA SSD. It will spring up at an angle of approx. 45° on the fixing clips side.
5. Gently pull the mSATA SSD card out.
6. In order to close the KBox C-101, proceed in reverse order (step 6 to 1 of the section 9.2).

☞ **Preventive Maintenance for SSD drive:**
Because of the limited predetermined lifespan of SSDs, we recommend to check the condition of your installed SSD drives via S.M.A.R.T. regularly.
Pay attention to the manufacturer specifications for lifespan.

10. Thermal Considerations

10.1. Available Processors

Please refer to the chapter 18 "Technical Specifications".

The list of processors is not complete and may be extended over the product lifetime.

10.2. Convection Cooling

The KBox C-101 is designed for convection cooling within the specified ambient air temperature ranges. Therefore it is imperative that air flow to and from the unit is guaranteed.

In addition, implementers must empirically verify the cooling concept for the KBox C-101 including optionally installed devices prior implementing the unit in the intended application.

10.3. Active Cooling via the optional Fan Tray

For applications where convection cooling is not sufficient, there is the possibility to use the optional fan tray (externally mounted to the KBox C-101-2 and KBox C-101-1). The optional fan tray extension allows to operate the system at higher ambient temperature conditions and provides a higher air flow through the chassis providing a better cooling of the system internal components.

10.4. Minimum System Clearance

To provide a maximum of airflow through and around the box, minimum distances to surrounding parts must be observed (please refer to the subsection 11.1 "Control Cabinet Mounting" and Fig. 46 to Fig. 50).

10.5. Maximum Temperatures

As the Intel® processors provide only certain settings for maximal power consumption some typically are used for the following table. This table can be seen as a guideline.

	KBox C-101 without Fan Tray		KBox C-101 with Fan Tray	
Processor Power Consumption	**Max. ambient Temperature [°C]**	**Approx. System internal Temp. Rise [°C]**	**Max. ambient Temperature [°C]**	**Approx. System internal Temp. Rise [°C]**
25W	65	5	70	2
37W	59	5	65	2
47W	50	5	55	2

The maximum system ambient temperature depends mostly on the power consumption of the processor and the chipset.

For the temperature evaluation a specialized tool from Intel® was used to set the processor to a defined workload. Depending on the power consumption one or more cores were set to 75% workload. This includes the graphics core. The tool also handles the usage of the "Turbo Mode" of certain processor types.

The processor utilization depends highly on the software used. Software using multicore feature will run on several cores whereas standard software will only utilise one core. In this case the processor will use the "Turbo Mode" to increase the clock for the core with the highest workload, as long as the temperature is within limits.

10.6. Third Party Components

When the KBox C-101 is extended and configured with third party components like PCIe extension cards and hard drives (HDD or SSD), it has to be taken into account that the air temperature inside the system is higher than the ambient temperature. An approximately internal temperature rise is given.

10.7. Processor Thermal Monitoring

The processor used with the KBox C-101 system provides internal thermal monitoring. Every core of the processor comprises a temperature sensor.

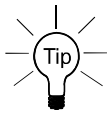
To allow an optimal operation and long-term reliability, the processor must operate in the specified temperature range. To avoid overheating the processor performs an automatic thermal management, which intends to keep the processor temperature below the highest value of the temperature range. This behavior is a CPU standard feature.

10.8. Processor Thermal Trip Feature

The Processor Thermal Trip feature protects the processor from catastrophic overheating. The Thermal Trip Tensor threshold is set well above the normal operating temperature to ensure that there are no false trips. The processor will stop all executions when the junction temperature exceeds approximately 125°C. This event will be indicated by the red blinking "Thermal" LED on the front panel. This behavior cannot be altered. Once activated, the event remains latched until power is cycled.

11. Installation Instructions

The KBox C-101 comes with attached wall mount brackets. The available mounting key holes (Fig. 32, pos. 1 and pos. 3) of the wall mounting brackets allow the unit attaching to a wall of a fire resistant enclosure.



Expansion card installation should be performed before installing the KBox C-101 into the control cabinet.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of the system chassis.

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Prior any installation work ensure that there are no live wires on the installation site

Do not handle the device if there is any damage visible.

Do not operate the KBox C-101 with foreign objects inside the chassis.

Further do not insert any retrieval device into the device while it is connected to power.

Kontron rejects all liability for any and all damages resulting from operation of the unit with foreign objects inside the chassis.

The KBox C-101 has to be installed and operated only by trained and qualified personnel.

The KBox C-101 system is designed for usage within control cabinets only.

Only personnel with appropriate qualifications, trainings and authorization are permitted to install and work with the Kontron KBox C-101.

This device shall only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements.

The KBox C-101 system is designed to be operated in vertical position with attached mounting brackets as shown in Fig. 8 and Fig. 9. It is not allowed to install the KBox C-101 as a stand-alone (desktop) device.

Do not remove the wall mounting brackets.

The unit must be placed such that there is sufficient space in front of it for connecting the cables to the I/O interface connectors and for operating the power button.

Leave sufficient free space around the unit to prevent the device from possibly overheating!

To ensure proper operation, we recommended free space as specified below:

- above and below: 100 mm (3.937")
- left and right: 50 mm (1.96").

See also Fig. 46 to Fig. 50 section 18.1 "Mechanical Specifications".

It must be observed that all ventilation openings are not covered/obstructed by objects.

The KBox C-101 must be firmly attached to a clean flat and solid mounting surface. Use proper fastening materials suitable for the mounting surface. Ensure that the mounting surface type and the used mounting solution safely support the load of the KBox C-101 and the attached components.

Please follow the local/national regulations for grounding.

The voltage feeds must not be overloaded. Adjust the cabling and the overcurrent protection to correspond with the electrical figures indicated on the type label.

The type label is located on the right side of the system.

It is recommended that the last cable attached to the system should be the power cable! Refer to the section 11.2 "DC Power Plug Terminal" and chapter 12 "Starting Up".

11.1. Control Cabinet Mounting

Please observe the "General Safety Instructions for IT Equipment" (included) and the installation instructions (refer to the chapters 4 and 11).

Your KBox C-101 is supplied with assembled mounting brackets. The key holes of the upper and lower mounting brackets (Fig. 32, pos. 1 and pos. 3) allow you to mount the KBox C-101 to a mounting side of the control cabinet in vertical position. This is the only permitted operating position.

For a sufficient air circulation around the device, we recommend not to place (mount) or operate any other devices within the "keep out area". The clearances of "50mm" and "100mm" around the KBox C-101 must be observed; refer to the marked areas in Fig. 46 to Fig. 50.

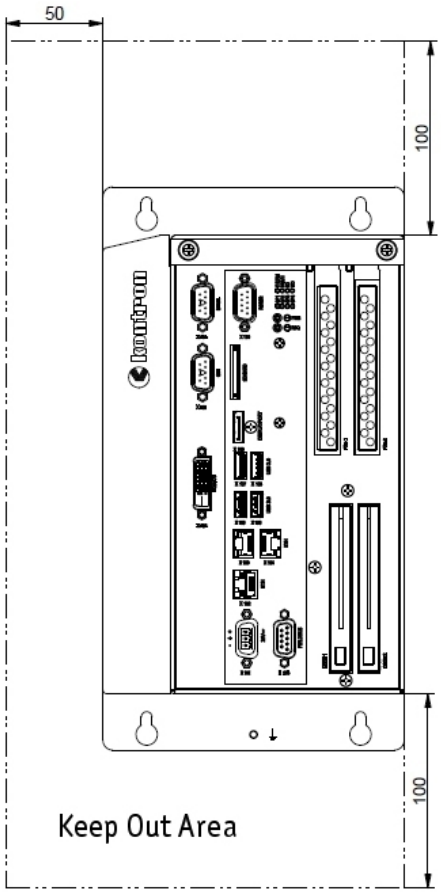


Fig. 46: Keep out area for mounting around KBox C-101-2 (front side view without fan tray)

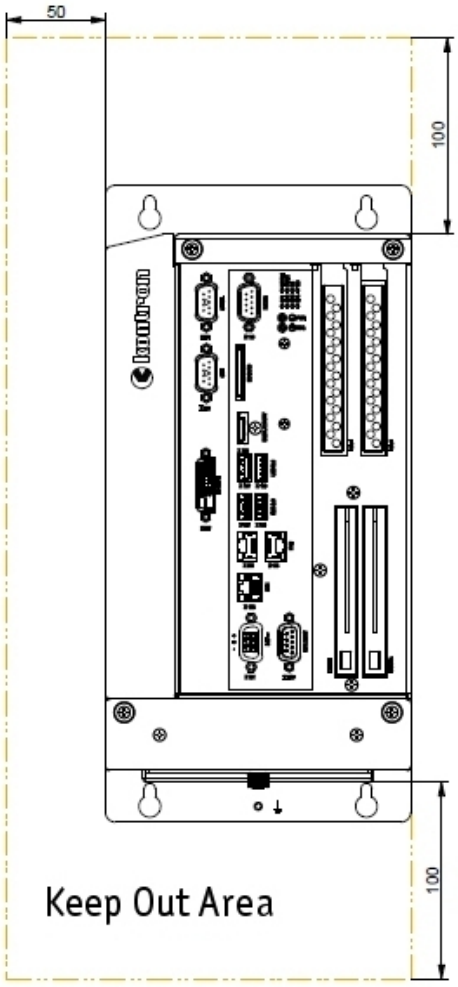


Fig. 47: Keep out area for mounting around KBox C-101-2 (front side view with optional fan tray)

Prepare the mounting surface with four screws and if necessary anchors corresponding to the mounting surface type (fire-resistant material). Please refer to the information for mounting to the section 18.1, "Mechanical Specifications of the KBox C-101", and the subsections 18.1.1 / 18.1.2 / 18.1.3 / 18.1.4 and 18.1.5, or refer to the drawings for KBox C-101 on our web site. The drawings can be downloaded from our web site www.kontron.com by selecting the product.

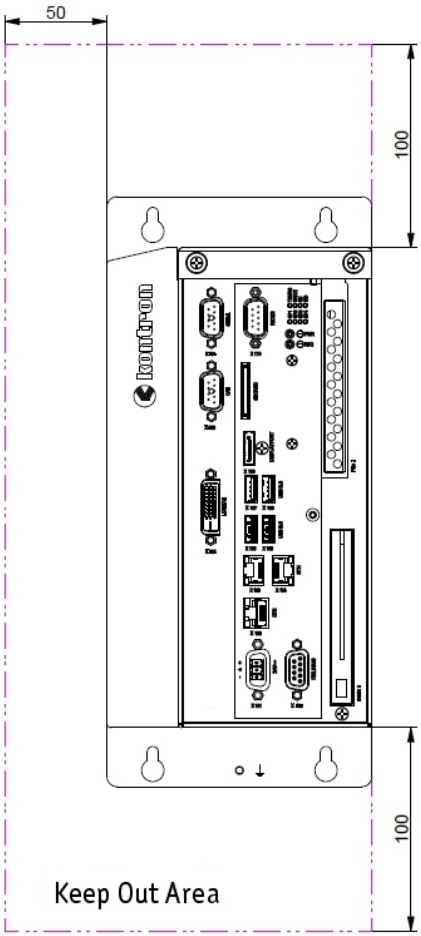


Fig. 48: Keep out area for mounting around KBox C-101-1 (front side view without fan tray)

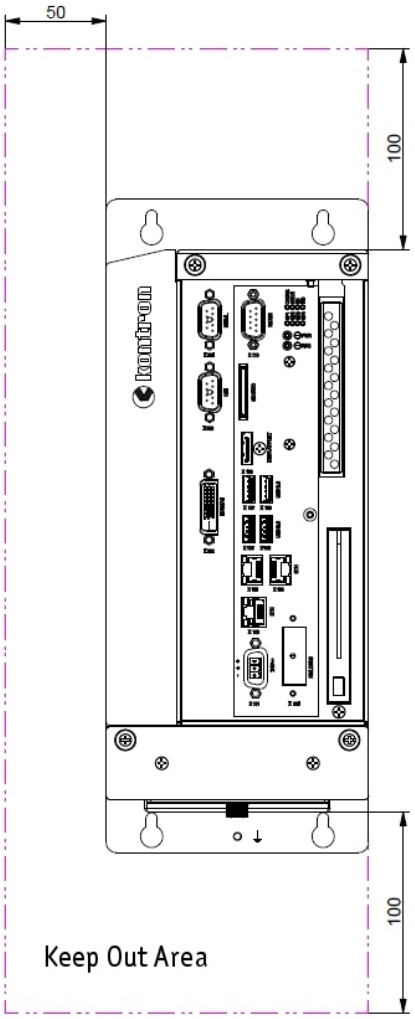


Fig. 49: Keep out area for mounting around KBox C-101-1 (front side view with optional fan tray)

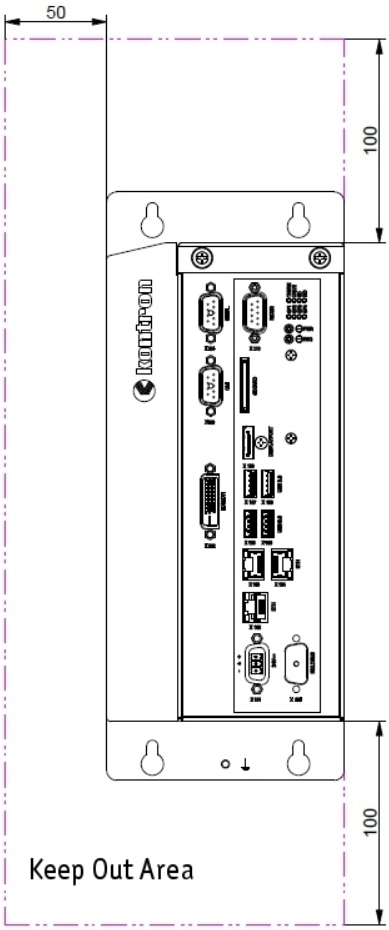


Fig. 50: Keep out area for mounting around KBox C-101-0

11.2. DC Power Plug Terminal

The KBox C-101 is connected by a Phoenix connector to a DC power source via a DC power supply wiring (only the Phoenix power plug terminal is included).

The KBox C-101 is delivered with a DC power plug terminal (3-pin Phoenix connector). For DC connection, prepare the connecting wires using the supplied Phoenix plug terminal: PSC 1,5/ 3-F.

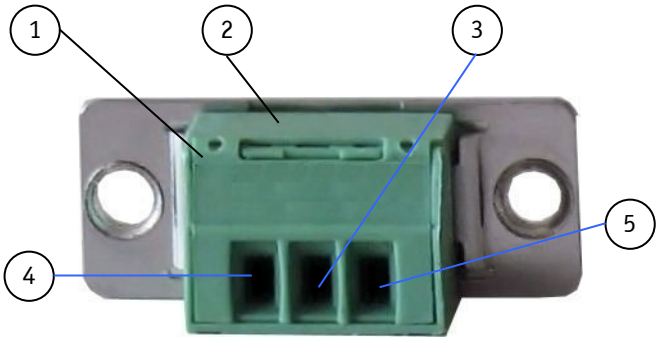


Fig. 51: Phoenix power plug terminal

1 3-pin Phoenix plug terminal
2 Cover over the slotted pan head screws
3 Location for inserting the functional earth wire
4 Location for inserting the "24V" wire
5 Location for inserting the "0V" wire

11.2.1. Cabling

For the pin assignment Phoenix power plug terminal refer to the subsection 7.4.1 "X101 - Power Input Connector".

1. Cut the required length three isolated wires (1 mm^2) AWG18 and strip each end 5 –7 mm.
2. Twist the striped wire-ends and provide them with ferrules.
3. Open the cover (Fig. 51, pos. 2) to have access to the slotted pan head screws.
4. Loosen the slotted pan head screws of the DC plug terminal far enough so that you can insert the end of the prepared wires.
5. Insert the wires into the corresponding clamp of the Phoenix plug terminal. Make sure that you have the right polarity of the connection [refer to Fig. 51, Fig. 18 or subsection 20.1.1, "(X 101) Power Input Connector"].
6. Fasten the screws to secure the wires into the clamps of the plug terminal.
7. Close the cover (Fig. 51, pos. 2).

12. Starting Up

The KBox C-101 must be operated only with the nominal voltage of 24V DC of type SELV. For details refer to the chapter 18 "Technical Specifications".

12.1. Connecting to DC Main Power Supply

The DC input connector (Fig. 58 and Fig. 18 marked X101) is located on the front side of the KBox C-101. The KBox C-101 will be connected to a DC main power supply via the supplied Phoenix power plug terminal (see Fig. 51) and corresponding power wires (prepared as described in the subsection 11.2.1 "Cabling").

	Before using your system, become familiar with the system components and check that everything is properly connected. Following a proper cabling procedure will prevent a false power-on condition, which could result in unit operational failure. When you install/disconnect the unit, the functional earth connection must always be made first and disconnected last. Also, it is recommended that the last connections attached to the system should be the power wires!
	The KBox C-101 must be connected DC mains power supply complying with the SELV (Safety Extra Low Voltage) requirements of EN 60950-1 standard. It must be observed that wiring and short-circuit/overcurrent protection is performed according to the applicable standards, regulations and respect to the electrical specification of the KBox C-101. Even when the system is turned off via the power button (Fig. 58/Fig. 60/Fig. 63 and Fig. 21, marked PWR) parts of the system are still energized. The disconnecting device (fuse/circuit backer) rating must be in accordance with the wire cross-section and the rated current of the KBox C-101.

The wires used for power connections must be clearly marked (+/-/functional earth) to ensure that they will be proper connected to the DC IN connector of the KBox C-101 and to the main power source, corresponding to signals marked; refer to Fig. 18 and Fig. 51.

In addition, the cables must have some form of support so as to minimize the strain on the unit's connectors.

To connect the KBox C-101 to a corresponding DC main power supply, please perform the following steps:

1. Ensure that the DC power source is switched off via a disconnecting device (circuit breaker), in order to ensure that no power is flowing from the external DC power source during the connection procedure.
2. Connect at first the wire for "Functional Earth stud" (Fig. 32, pos. 6) to an appropriate "common earth" connection point.
3. Connect the Phoenix power terminal prepared as described in the subsection 11.2.1 "Cabling" to the DC input connector (Fig. 58/Fig. 60/Fig. 63 and Fig. 18 marked X101) of the KBox C-101. The DC input connector is located on the front side and is marked "24VDC".
4. Connect the other ends of the DC power wires to the connections of the DC main power supply. Pay attention to the polarity of the connections.
5. Switch on the disconnecting device (circuit breaker) in order to apply voltage to the terminals of the power wires.

12.2. Power OFF/ON Procedure

As the KBox C-101 is equipped with an internal hold-up buffer, it can't be powered off/on immediately.
The buffer time depends on the power consumption and load on the KBox C-101 processor and peripherals. Therefore the following procedure must be observed.

1. Close your applications and perform an orderly shutdown (graceful shutdown).
2. Remove power from the system.
3. Wait until the green power LED (Fig. 21, pos. 2) stops blinking.
4. Wait at least 3 seconds.
5. Reapply power.

Refer also to the subsection 7.4.8 "POWER Button and PWR LED".

Caution!
Do not disconnect the power from your system while it is powered up!

Performing a forced shutdown can lead to loss of data or other undesirable effects!

12.3. Operating System and Hardware Component Drivers

Your system can be supplied optionally with a pre-installed operating system.

If you have ordered your KBox C-101 with a pre-installed operating system, all drivers are installed in accordance with the system configuration ordered (optional hardware components). Your system is fully operational when you power it on for the first time. Please pay attention to the following note.

Important information on the use of the pre-installed "WINDOWS 7 ULTIMATE FOR EMBEDDED SYSTEMS" or "WINDOWS 7 PROFESSIONAL FOR EMBEDDED SYSTEMS" operating systems:

The terms and conditions for the use of the pre-installed operating systems are specified in the document "MICROSOFT SOFTWARE LICENSE TERMS".

You can download this document from our web site www.kontron.com by selecting Product/ Downloads tab/Windows.

If you have ordered The KBox C-101 without a pre-installed operating system, you will need to install the operating system and the appropriate drivers for the system configuration you have ordered (optional hardware components) yourself.

You can download the relevant drivers for the installed hardware from our web site at www.kontron.com by selecting the product.

Pay attention to the manufacturer specifications of the operating system and the integrated hardware components.

13. Maintenance and Cleaning

Equipment from Kontron requires only minimum servicing and maintenance for proper operation.

- ❑ For light soiling, clean the KBox C-101 with a dry cloth.
  Carefully remove dust from the surface of the cooling fins of the chassis using a clean, soft brush.
- ❑ Stubborn dirt should be removed using a mild detergent and a soft cloth.

☞ Do not use steel wool, metallic threads or solvents like abrasives, alcohol, acetone or benzene for cleaning the KBox C-101.

13.1. Replacing the Lithium Battery

If your KBox C-101 is equipped with the optional lithium battery (externally-accessible), and you have to replace it, please proceed as follows:

1. Unscrew the screw (Fig. 4, pos. 2), that secure the battery protective cover (Fig. 4, pos. 1) to the chassis.
2. Remove the screw and the cover to have access to the battery (Fig. 5, pos.3). Retain them for later use.
3. Remove the lithium battery from the holder by pulling it outwards.
4. Place a new lithium battery in the battery holder.
5. Pay attention to the polarity of the battery (as shown in Fig. 52).
6. The lithium battery must only be replaced with the same type of battery or with a type of battery recommended by Kontron Europe.
7. Replace the protective cover over the battery and secure the cover with the retained screw.

☞ Please note that only the Philips countersunk head screw M2.5x10 DIN965 (removed in step 2) may be used to secure the protective cover. Longer screws than M2.5x14 could damage internal components of the system.

Fig. 52: Lithium battery polarity

Caution

Danger of explosion when replacing with wrong type of battery. Replace only with the same or equivalent type recommended by the manufacturer. The lithium battery type must be UL recognised.

Do not dispose of lithium batteries in general trash collection. Dispose of the battery according to the local regulations dealing with the disposal of these special materials, (e.g. to the collecting points for dispose of batteries).

13.2. Preventive Maintenance for SSD Drives

This section applies to all mSATA and SSD devices installed into the KBox C-101 system.

Because of the limited predetermined lifespan of the mSATA/SATA SSD devices, we recommend to check the condition of your installed SSD drives via S.M.A.R.T. regularly.

Pay attention to the manufacturer specifications for lifespan.

For replacing of these devices refer to the sections: 7.4.13 and 9.3.7.

13.3. Replacing the Fan Tray

The operation of the KBox C-101 versions with fan tray extension is permitted only with a functional fan tray!

Defective components may only be replaced by Kontron original spare parts:

- Part number of the fan tray: 1055-4009 for KBox C-101-2
- Part number of the fan tray: 1056-7503 for KBox C-101-1

The fan tray can be replaced during operation. This should only be carried-out by qualified personnel aware of the associated dangers.

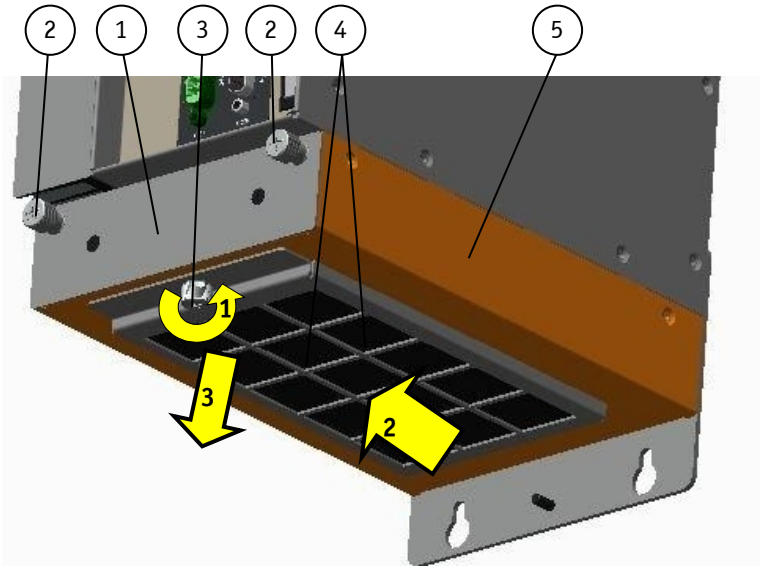
The fan will not stop immediately when the fan tray is removed during operation. Pull out the fan tray only a few centimeters and wait until the fan comes to stop.

To replace fan tray, proceed as follows:

1. Ensure to have access to the bottom side of the KBox C-101-2/-1. The fan tray (Fig. 53, pos. 1 and Fig. 54, pos. 2) may be replaced without removing the air filter holder (Fig. 53, pos. 4).
2. Loosen the two knurled screws (Fig. 53, pos. 2) of the fan tray.
3. Pull the fan tray (Fig. 54, pos. 2) out from the fan tray slot (Fig. 54, pos. 3) in order to disconnect the connector for fan power and control (Fig. 36, pos. 3) from the internal fan control socket (Fig. 54, pos. 10).
4. Pull the fan tray completely out from the fan tray slot (Fig. 54, pos. 3).
5. Replace the defective fan tray with a new one.
6. Insert the functional fan tray (Fig. 54, pos. 2) into the fan tray slot (Fig. 54, pos. 3).
7. Secure the fan tray by fastening the knurled screws (Fig. 53, pos. 2). By fastening of the knurled screws the proper insertion of the fan tray into the internal socket (Fig. 54, pos. 10) is ensured.

13.4. Cleaning the Air Filter

The air filter is inserted in the holder (Fig. 35, pos. 2) at the bottom side of the fan tray slot (Fig. 35, pos. 6). The soiling of the air filter (Fig. 35, pos. 3) is caused by the pollution of the operating environment. A heavily soiled air filter can cause excessive heating of the device. For this reason we recommend to clean the air filter as often as necessary. The air filter can be changed during operation of the system.



1 Fan tray
2 Knurled screws of the fan tray
3 Knurled screw of the air filter holder
4 Air filter holder
5 Fan tray slot

Fig. 53: Fan tray extension (detail: shown as KBox C-101-1)

To replace the air filter, proceed as follows:

1. Ensure to have access to the bottom side of the KBox C-101-2/-1. The air filter may be replaced without removing the fan tray (Fig. 53, pos. 1).
2. Loosen the knurled screw (Fig. 53, pos. 3) that secures the air filter holder (Fig. 53, pos. 4) to the fan tray slot (Fig. 53, pos. 5); refer to step 1 in Fig. 53.
3. Pull the air filter holder out of the positioning holes, (Fig. 54, pos. 9) into the marked direction (see Fig. 53) and pull it down. Put the air filter holder aside for later reassembly; refer to step 2 and 3 in Fig. 53.
4. Remove the soiled air filter (Fig. 53, pos. 3 and Fig. 54, pos. 6).
5. Clean the air filter as follows:
   - ❑ Rinse in water (up to approx. 40°C; possibly with the addition of a standard mild detergent).
   - ❑ It is possible to clean the air filter with compressed air.
   - ❑ For dirt that contains grease/oil, the air filter should be rinsed with warm water with the addition of a degreaser. Air filter should not be cleaned with powerful water jets or wrung out.
6. After cleaning and drying the air filter, place it in the air filter holder.
7. Reattach the air filter holder to the bottom side of the fan tray slot by inserting the positioning latches (Fig. 54, pos. 8) into the positioning holes (Fig. 54, pos. 9).
8. Secure the air filter holder by tightening the knurled screw to the tapped hole (Fig. 54, pos. 4) of the fan tray slot (Fig. 53, pos. 5 or Fig. 54, pos. 3).

Defective components may only be replaced by Kontron original spare parts.

- ❑ Air filter: part number: 1055-4670 (for KBox C-101-2)
- ❑ Air filter: part number: 1056-7507 (for KBox C-101-1)

	The pictures in this section correspond to a KBox C-101-2 system. The description of the procedure for cleaning the air filter can be applied to both KBox C-101-2/-1 variants, under consideration of the different mechanical specifications.

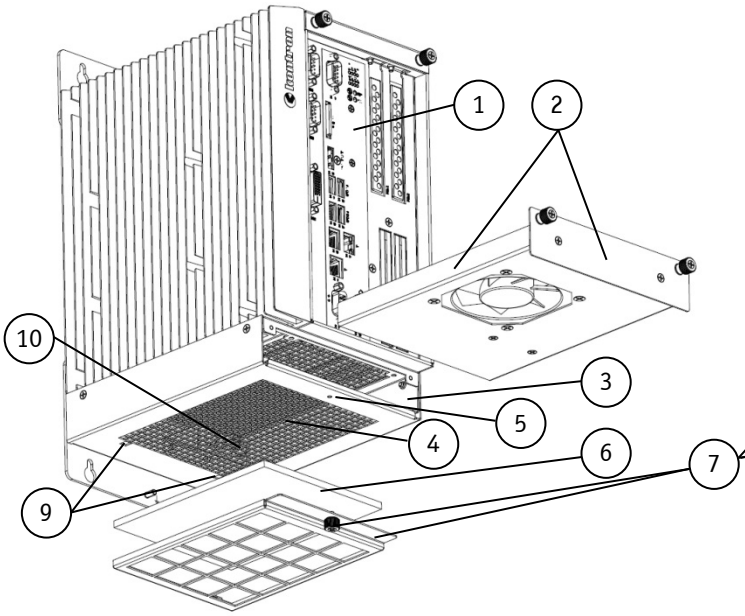


Fig. 54: KBox C-101-2 with removed fan tray and removed air filter

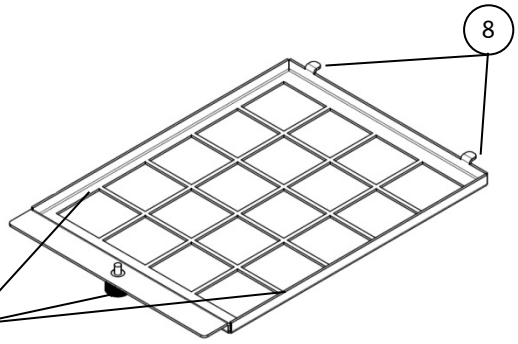


Fig. 55: Holder without air filter

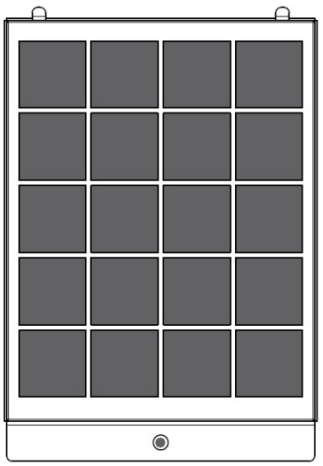


Fig. 56: Holder (shown for a KBox C-101-2) with air filter

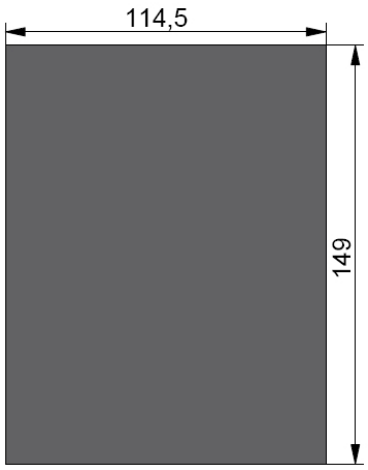


Fig. 57: Air filter (shown for a KBox C-101-2)

Legend for Fig. 54 **and** Fig. 55:

1 KBox C-101 assembled with the optional fan tray slot
2 Removed fan tray
3 Fan tray slot without inserted fan tray
4 Air intake openings at the bottom side of the fan tray slot
5 Tapped hole to secure the knurled screw of the air filter holder
6 Removed air filter
7 Air filter holder with knurled screw
8 Positioning latches of the air filter holder
9 Positioning holes for the air filter holder
10 Socket for fan power and control (on internal rear side of the fan tray slot)

14. KBox C-101-2 Variant

Please refer to the description in this manual for KBox C-101 and the chapter 18 "Technical Specifications".

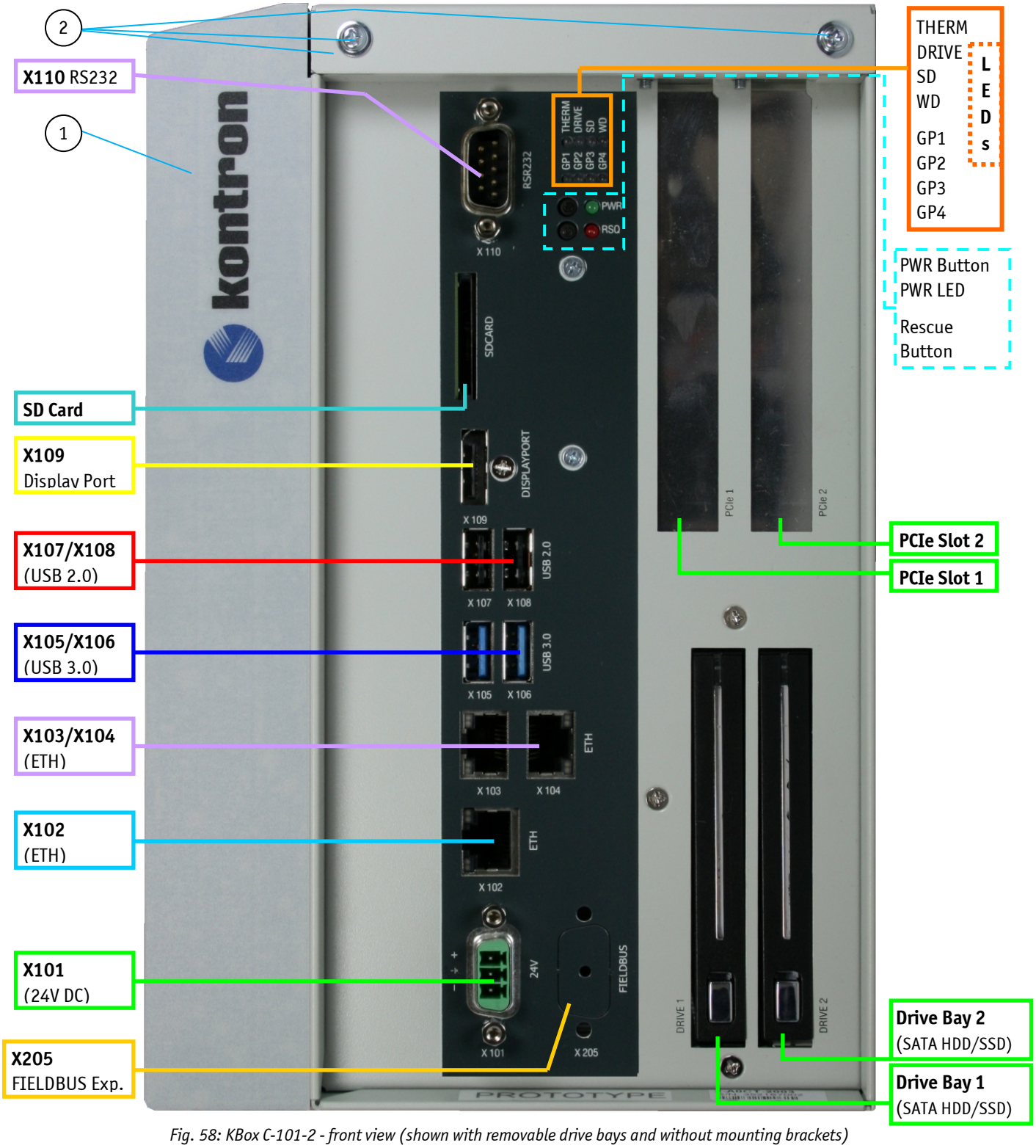


Fig. 58: KBox C-101-2 - front view (shown with removable drive bays and without mounting brackets)

1 Side of KBox C-101-2 with cooling fins
2 Top side cover with knurled screws

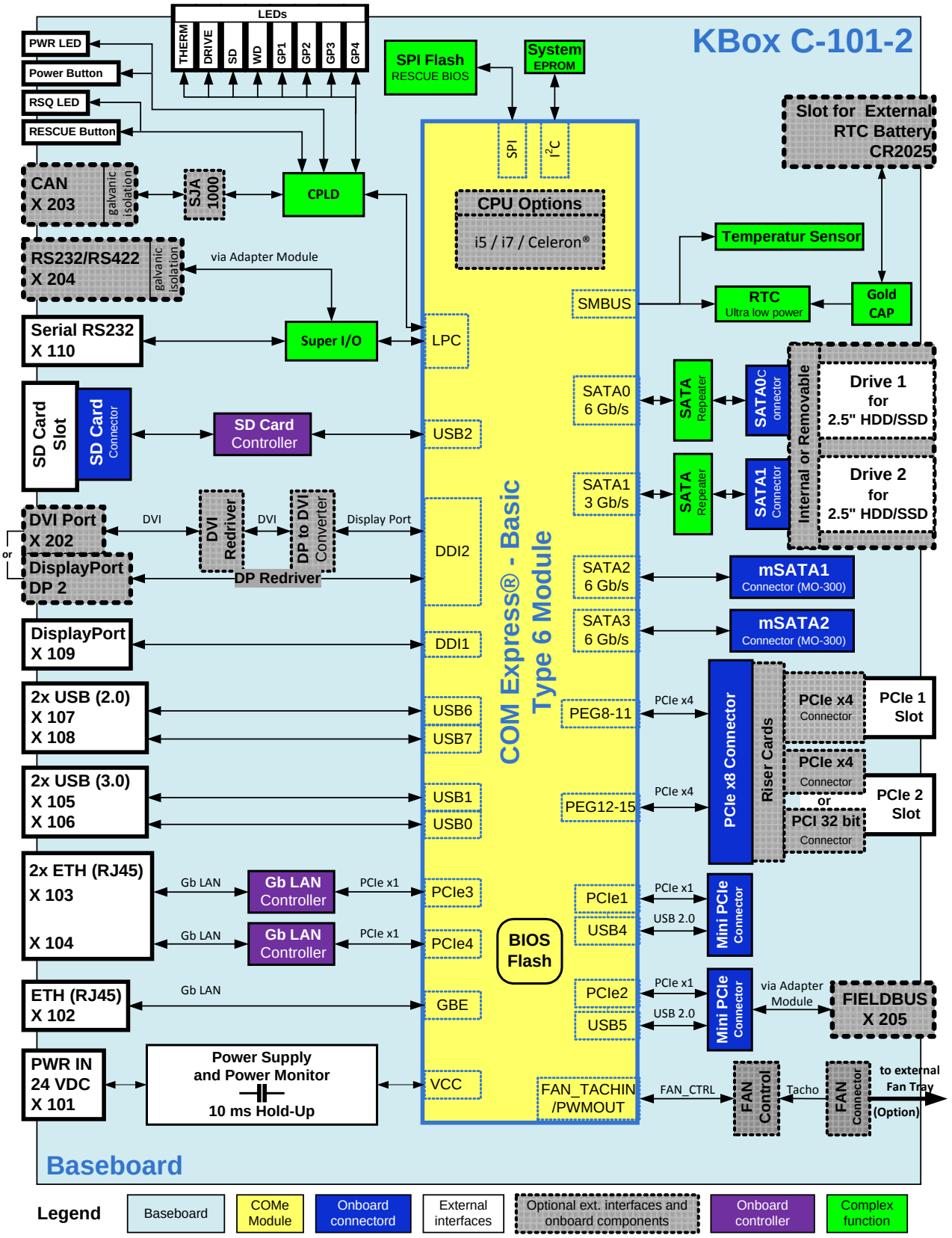


Fig. 59: Block Diagram - KBox C-101-2

15. KBox C-101-1 Variant

Please refer to the description in this manual for KBox C-101 and the chapter 18 "Technical Specifications".

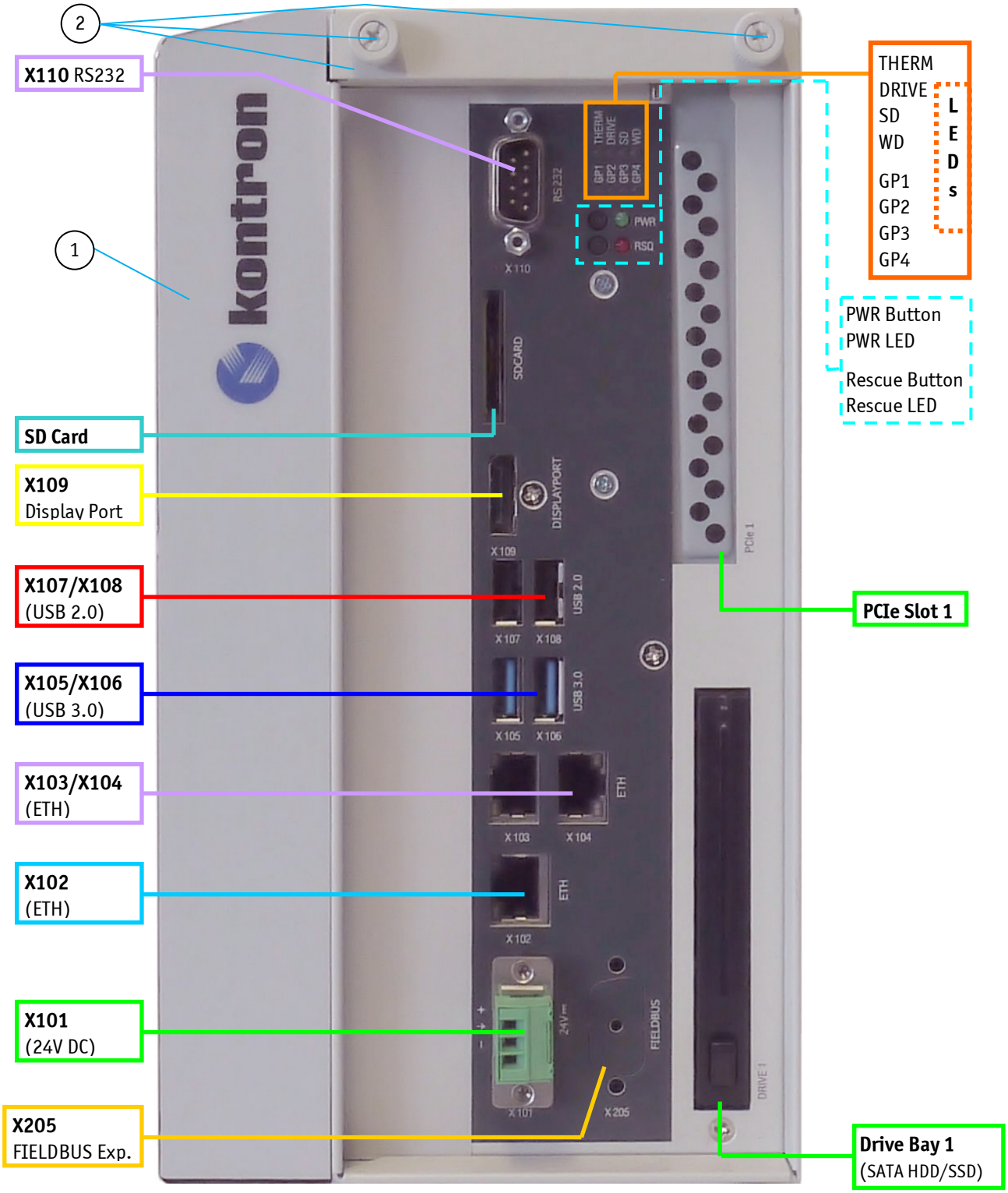


Fig. 60: KBox C-101-1 - front view (shown with removable drive bay without mounting brackets)

1 Side of KBox C-101-1 with cooling fins

2 Top side cover with knurled screws

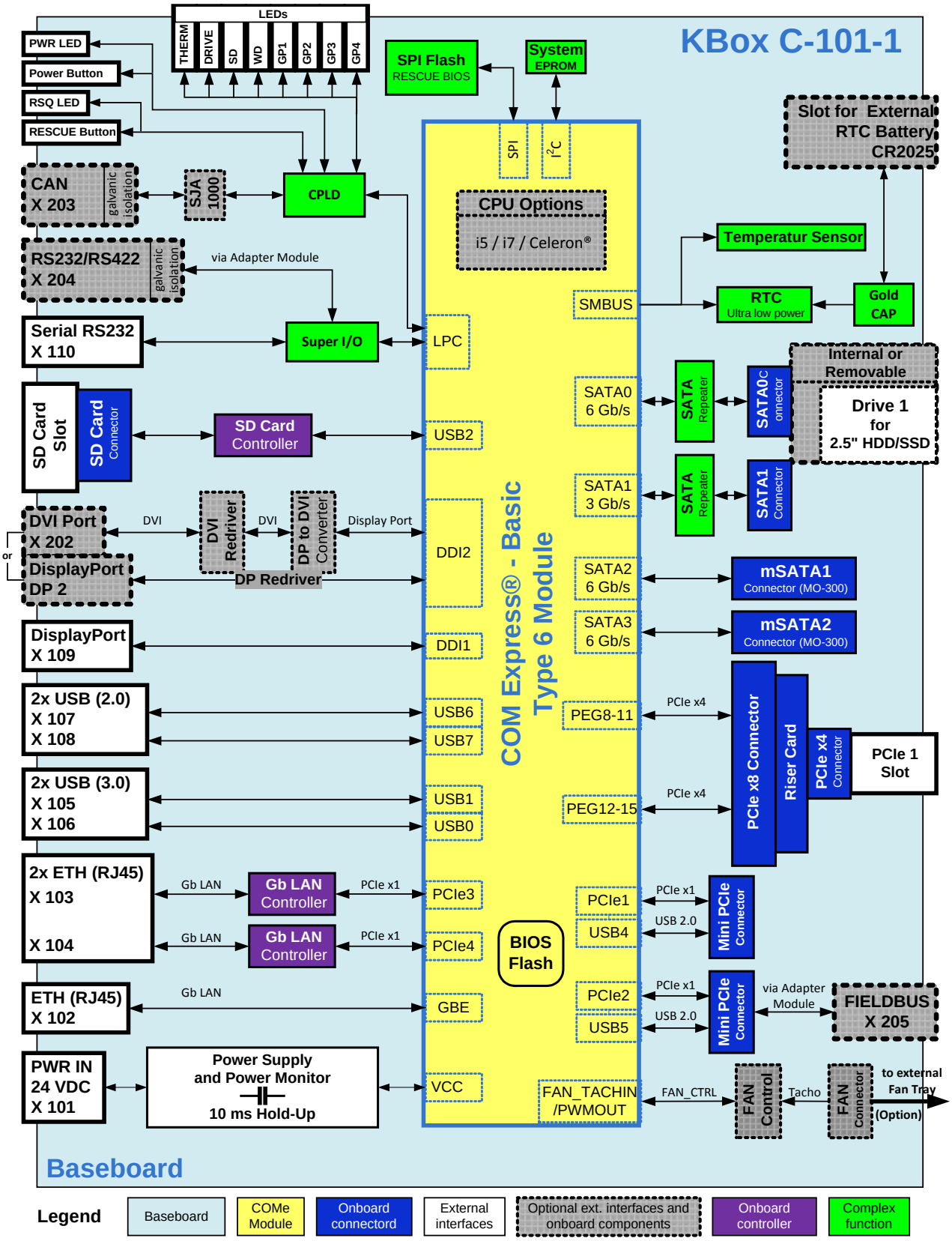


Fig. 61: Block Diagram - KBox C-101-1

15.1. KBox C-101-1 - System Expansion Capabilities

	Please observe that the KBox C-101-1 can be equipped with only one internal 2.5" SATA HDD/SSD or one removable 2.5" SATA HDD/SSD. Only the "PCIe 1" slot for one PCIe x4/PCIe x1 expansion card is available on the front side of the system. Refer also to the subsection 7.4. For system design refer also to Fig. Fig. 60, Fig. 61, chapter 18 "Technical Specifications" and subsection 18.1.3 and 18.1.4.

15.1.1. PCIe Expansion Slot 1

The KBox C-101-1 provides at the front side one "PCIe 1" slot (Fig. 60,). You can install a half-length PCIe x4 or PCIe x1 expansion card. To access the PCIe x4 socket in order to install or remove the PCIe expansion card you have to remove the top side access cover. For a better accessibility of the expansion socket you should remove the right side access cover (Fig. 30 and Fig. 28, pos. 1 and pos. 3) also; (The description in the subsection 7.5 "Left and Right Side View" is valid also for KBox C-101-1).

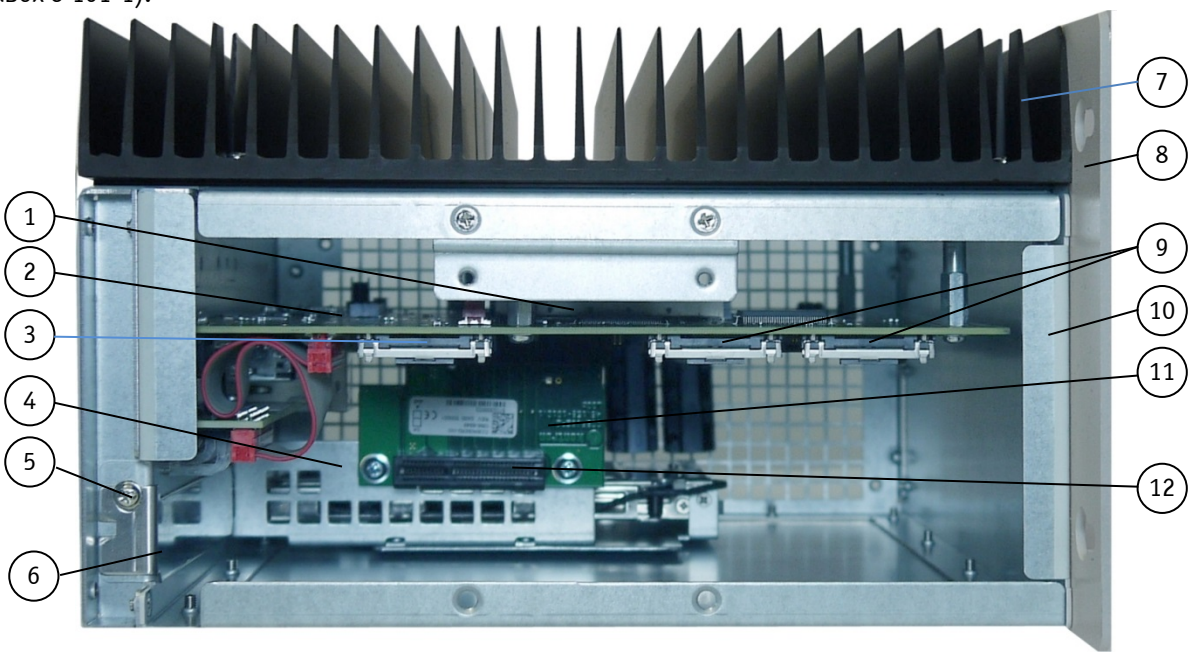


Fig. 62: Inside of the KBox C-101-1 (shown with a removable HDD)

1 COM Express module
2 Baseboard
3 Mechanical fixing assemblies for 1x PCIe Mini card; (two fixing bolts for each PCIe Mini card)
4 Installed removable 2.5" drive bay (not included)
5 Screw to secure the expansion slot/card bracket
6 Slot bracket for the for the PCIe 1 expansion slot
7 Cooling fins
8 Upper mounting bracket with key holes
9 Mechanical fixing assemblies for 2x 2.5" mSATA SSD (two fixing bolts for each mSATA SSD)
10 Cover retaining plate on the rear side
11 Riser card with 1x PCIe x4 expansion socket
12 Free PCIe x4 socket (for PCIe 1 slot)

For installation/removing of the PCIe expansion card (installed into the "PCIe 1" slot) refer to the subsection 9.3.5 "Installing/Removing the PCI/PCIe Expansion Cards", with observation that only one PCIe slot is available ("PCIe 1").

	Please observe that for KBox C-101-1 only one PCIex4/PCIe x1 expansion card can be installed into the available PCIe x4 socket of the riser card (Fig. 62, pos. 11 and pos. 12).

15.1.2. Internal or Removable 2.5" SATA HDD/SSD

Depending on the ordered system configuration, your KBox C-101-1 can be equipped with one 2.5" SATA removable drive bay (refer to Fig. 60, "DRIVE 1") or one internal mounting frame for 2.5" SATA HDD/SSD.

The internal 2.5" HDD/SSD is not accessible from the outside. The internal SATA HDD/SSD is installed (always factory installed) into the system by the use of a mounting frame.

The drive bay (DRIVE 1) for removable 2.5" SATA HDD/SSD is accessible from the front side of the system.

This interface of the KBox C-101-1 system (if internal or external accessible) supports speeds of up to SATA 6 Gb/s.

This SATA interface supports hot-swapping.

To prevent data loss, don't remove the HDD/SSD during read/write activity [while the "DRIVE LED" (Fig. 22) is flashing green].

Your KBox C-101-1 can be equipped with one drive bay for a removable HDD/SSD (refer to Fig. 60, "DRIVE 1") or one internal mounting frame for a 2.5" SATA HDD/SSD.

If the KBox C-101-1 configuration with internal 2.5" SATA HDD/SSD was ordered, the "DRIVE 1" for removable 2.5" SATA SATA HDD/SSD is not available on the front side of the system; refer to Fig. 9, under consideration of the system design (Fig. 60, Fig. 61) and mechanical differences (see 18.1.3 and 18.1.4).

Refer also to the area marked "D" in the section 7.4.

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16. KBox C-101-0 Variant

Please refer to the description in this manual for KBox C-101 and the chapter 18 "Technical Specifications".

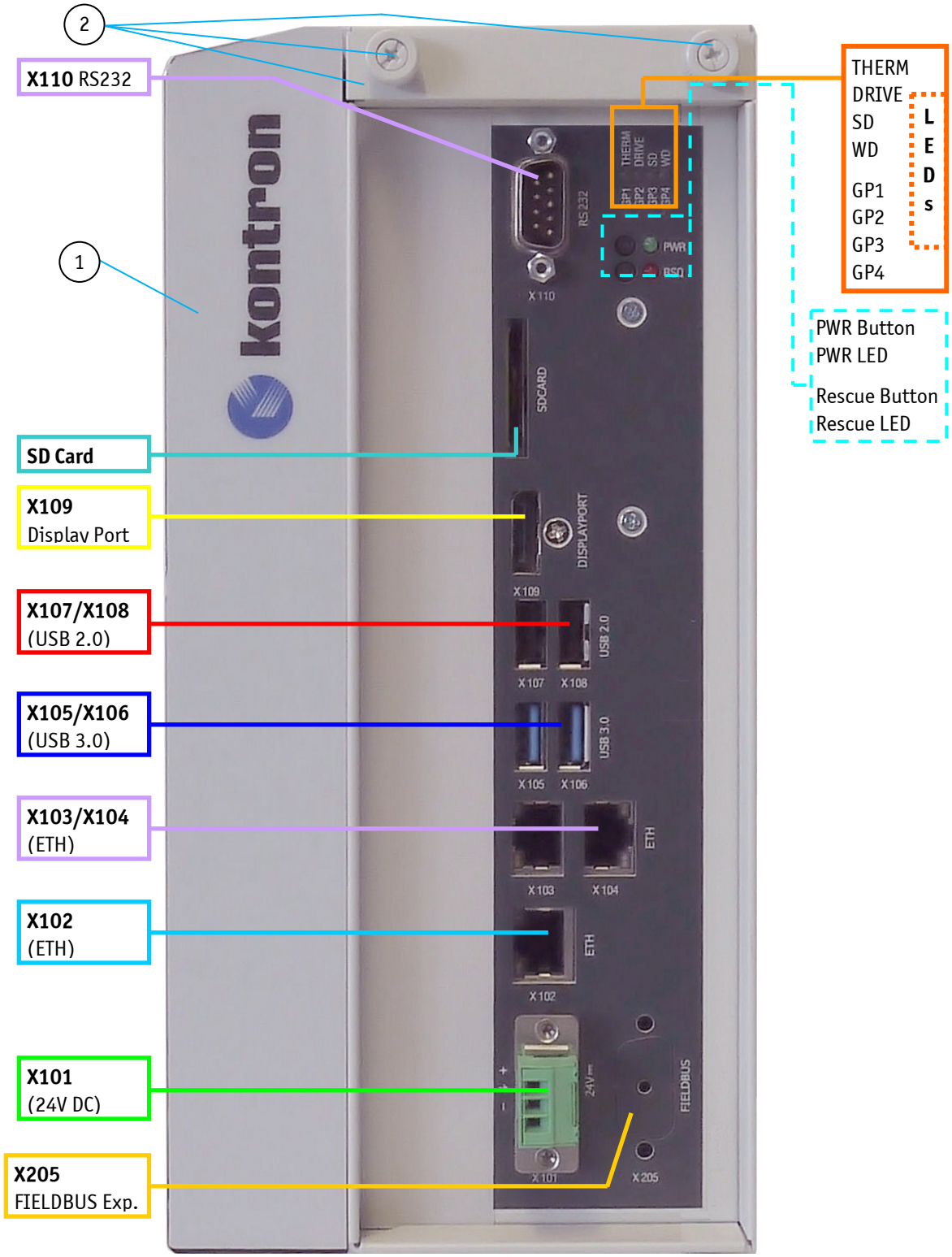


Fig. 63: KBox C-101-0 - front view (shown without mounting brackets)

1 Side of KBox C-101-0 with cooling fins

2 Top side cover with knurled screws

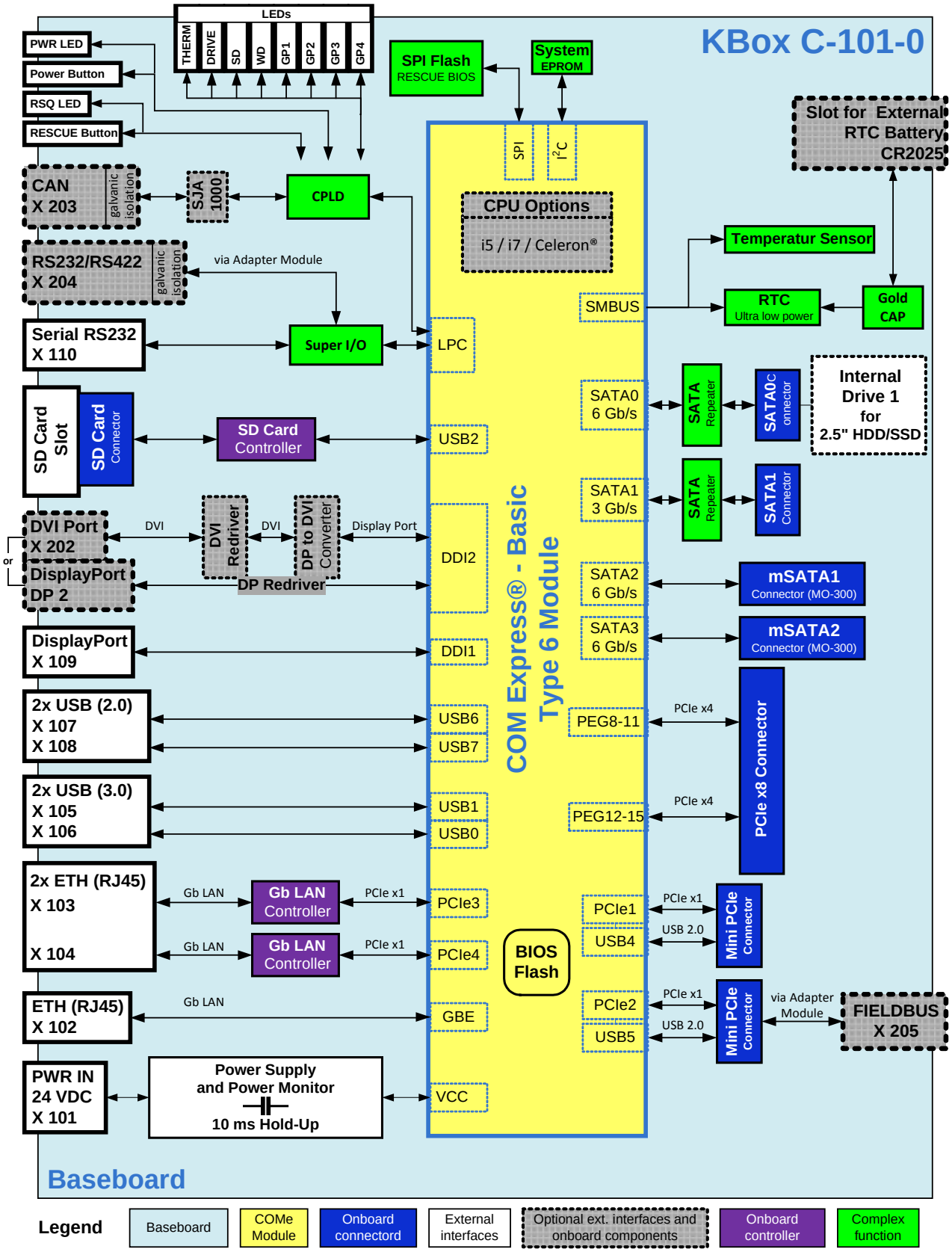


Fig. 64: Block Diagram - KBox C-101-0

16.1. KBox C-101-0 - System Expansion Capabilities

	Please observe that the KBox C-101-0 can be equipped with only one internal 2.5" SATA HDD/SSD. No external accessible removable drive bay and PCIe slot are available on the front side. Refer also to the subsection 7.4. For system design refer also to Fig. 63, Fig. 64, chapter 18 "Technical Specifications" and subsection 18.1.5 "Mechanical Specifications of the KBox C-101-0".

16.1.1. Internal 2.5" SATA Drive

The KBox C-101-0 can be equipped with only one internal 2.5" SATA HDD/SSD (always factory installed).
The picture below shows the KBox C-101-0 configuration with the internal 2.5" SATA SSD (installed into the mounting frame).

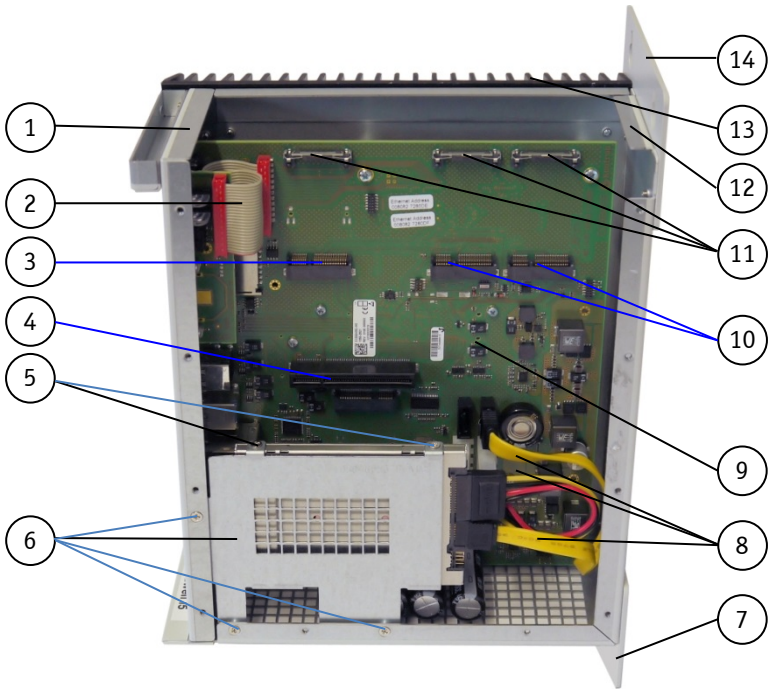


Fig. 65: KBox C-101-0 - internal view with the internal HDD/SSD drive

1 Cover retaining bracket on the front side
2 LED indicators circuit
3 1x Mini PCIe socket for PCIe Mini card (please observe the note below)
4 PCI x8 socket (not used in this configuration)
5 Screws that secure the internal 2.5" SATA HDD/SSD into the mounting frame
6 Mounting frame for the 1x internal 2.5" SATA HDD/SSD and screws that secure it to the chassis
7 Lower mounting bracket with key holes
8 1x SATA cable connections (power and data)
9 Baseboard
10 2x mSATA sockets
11 Mechanical fixing assemblies for:
2x 2.5" mSATA SSD and 1x PCIe Mini card (two fixing bolts for each mSATA SSD and PCIe Mini card) (please observe the note below)
12 Cover retaining bracket on the rear side
13 Cooling fins
14 Upper mounting bracket with key holes

The KBox C-101 provides two internal Mini PCIe sockets. You can see one of them in Fig. 42, pos. 4.
The second Mini PCIe socket is on the bottom side of the baseboard and can be only at factory equipped with an expansion card.

17. uEFI BIOS

The integrated COMExpress® module (COMe-bHL6) integrated in the KBox C-101 is equipped with Phoenix SecureCore, which is located in an onboard SPI serial flash memory. The uEFI (Unified Extensible Firmware Interface)/BIOS is set at the factory, corresponding to the system's standard hardware configuration and for normal operating conditions. Therefore there is no need to set or change the BIOS environment to operate your system.

A detailed BIOS description can be found in the manual of the installed COMExpress® module. You can download the corresponding manual from our web site www.kontron.com by selecting the product name.

The Kontron uEFI BIOS features a built-in and enhanced version of the uEFI Shell. For a detailed description of the available standard shell scripting refer to the EFI Shell User's Guide. For a detailed description of the available standard shell commands, refer to the EFI Shell Command Manual. Both documents can be downloaded from the EFI and Framework Open Source Community homepage (http://sourceforge.net/projects/efi-shell/files/documents/).

Please note that not all shell commands described in the EFI Shell Command Manual are provided by the Kontron uEFI BIOS.

17.1. uEFI Shell Introduction, Basic Operation

The uEFI Shell forms an entry into the uEFI boot order and is the first boot option by default.

17.1.1. Entering the uEFI Shell

To enter the uEFI Shell, follow the steps below:

1. Power on the board.
2. Ignore the message: "Press the <F2> key".
3. Press the ESC key within 5 seconds after a message such as the one below appears:

```
EFI Shell version 2.31 [4660.22136]
Current running mode 1.1.2
Device mapping table
blk0      :Removable HardDisk - Alias hd33b0b0b fs0
           Acpi(PNP0A03,0)/Pci(1D|7)/Usb(1, 0)/Usb(1, 0)/HD(Part1,Sig17731773)
...
```

Press the <ESC> key within 5 seconds to skip **`startup.nsh`**, and any other key to continue.

The output produced by the device mapping table can vary depending on the board's configuration.

If the <ESC> key is pressed before the 5-second timeout has elapsed, the shell prompt is shown:

```
Shell>
```

17.1.2. Exiting the uEFI Shell

To exit the uEFI Shell, follow one of the steps below:

1. Invoke the exit uEFI Shell command to select the boot device in the boot menu for the OS to boot from.
2. Reset the board using the reset uEFI Shell command.

17.1.3. Kontron-Specific uEFI Shell Commands

The Kontron uEFI implementation provides the following additional commands related to the specific HW features of the Kontron system.

COMMAND	DESCRIPTION
kBoardInfo	Shows a summary of board-specific data and displays/checks various parameters such as the current uEFI BIOS revision, etc.
kBootScript	Manages the flash-stored startup script If the shell is launched by the boot process, it executes a shell script stored in the flash. If the shell script terminates, the shell will continue the boot process. However, the shell script can also contain any other boot command.
kNvram	Manages the NVRAM to restore the system's default settings Since all uEFI settings are stored inside the NVRAM, the default settings are loaded after invoking this command.
kFlash	Programs and verifies the SPI boot flashes holding the uEFI BIOS code uEFI BIOS binary files must be available from connected mass storage devices, such as USB flash drive or hard disk.
kRamdisk	Creates and manages RAMdisks This command is used to perform file operations when no real file system is connected to the system.
kWatchdog	Configures the Kontron onboard Watchdog This command is used to enable the Kontron onboard Watchdog with reset target before OS boot. This can be used to detect if the OS fails to boot and react by reset.
kUpdate	Controls the Kontron common update tool When using the **kUpdate** command, the structure of the ZIP archive must not be altered. **kUpdate** automatically starts the update procedure via **kUpdate -u**. If a certain image is intended to be used, enter **kUpdate -s** to select the respective image.

The uEFI Shell commands are not case-sensitive. Each uEFI Shell command is provided with a detailed online help that can be invoked by entering "<cmd> <space> <-?>" in the command line. To display the uEFI Shell command list, enter <help> or <?> in the command line.

17.2. uEFI Shell Scripting

17.2.1. Startup Scripting

If the ESC key is not pressed and the timeout is run out, the uEFI Shell tries to execute some startup scripts automatically. It searches for scripts and executes them in the following order:

1. Kontron flash-stored startup script.
2. If there is no Kontron flash-stored startup script present, the uEFI-specified `startup.nsh` script is used. This script must be located on the root of any of the attached FAT formatted disk drive.
3. If none of the startup scripts is present or the startup script terminates, the default boot order is continued.

17.2.2. Create a Startup Script

Startup scripts can be created using the uEFI Shell built-in editor **edit** or under any OS with a plain text editor of your choice. To create a startup shell script, simply save the script on the root of any FAT-formatted drive attached to the system. To copy the startup script to the flash, use the **kBootScript** uEFI Shell command.

In case there is no mass storage device attached, the startup script can be generated in a RAM disk and stored in the SPI boot flash using the **kRamdisk** uEFI Shell command.

17.2.3. Examples of Startup Scripts

17.2.3.1. Execute Shell Script on other Hard Drive

This example (**`startup.nsh`**) executes the shell script named **`bootme.nsh`** located in the root of the first detected disc drive (**`fs0`**).

17.2.3.2. Execute Shell Script on other Hard Drive

This example (**`startup.nsh`**) executes the shell script named **`bootme.nsh`** located in the root of the first detected disc drive (**`fs0`**).

```
fs0:

bootme.nsh
```

17.2.3.3. Enable Watchdog

The uEFI Shell provides environment variables used to control the execution flow.
The following sample start-up script shows the uEFI Shell environment **`wdt_enable`**, used to control the Watchdog.

```
echo -off
echo “Executing sample startup.nsh...”
if %wdt_enable% == “on” then
   kwatchdog -t 15
   echo “Watchdog enabled”
endif
```

To create uEFI Shell environment variable, use the set uEFI Shell command as shown below:

```
Shell> set wdt_enable on
Shell> set
   wdt_enable : on
Shell> reset
```

17.2.3.4. Handling the Startup Script in the SPI Boot Flash

In case there is no mass storage device attached, the startup script can be generated in a RAM disk and stored in the SPI boot flash using the following instructions:

1. Press <ESC> during power-up to log into the uEFI Shell.
2. Create a RAM disk and set the proper working directory as shown below:

```
Shell> kramdisk -s 3-c -m myramdisk
Shell> myramdisk:
```

3. Enter the sample start-up script mentioned above in this section using the **edit** uEFI Shell command:

```
myramdisk:\> edit boot.nsh
```

4. Save the start-up script to the SPI boot flash using the **kBootScript** uEFI Shell command:

```
myramdisk:\> kbootscript -p boot.nsh
```

5. Reset the board to execute the newly installed script using the **reset** uEFI Shell command:

```
myramdisk:\> reset
```

6. If a script is already installed, it can be edited using the following kBootScript uEFI Shell commands:

```
myramdisk:\> kbootscript -g boot.nsh
myramdisk:\> edit boot.nsh
```

17.3. Updating the uEFI BIOS

The standard SPI boot flash can be updated with the latest uEFI BIOS from the ZIP archive using the **kUpdate -u** or the **kFlash -p** uEFI Shell command. When using the **kUpdate** command, the directory structure of ZIP archive must not be altered. The update status is indicated in the log file located in the directory where the firmware images are stored.

To have the same content in both SPI boot flashes, clone the standard SPI boot flash to the recovery SPI boot flash using the **kflash -c** uEFI Shell.

17.3.1. uEFI BIOS Recovery

In case of the standard SPI boot flash being corrupted and therefore the system is not starting up, it can be booted from the recovery SPI boot flash. For further information, refer to Chapter 7.4.9 "RESCUE Button and RSQ LED".

The uEFI BIOS code and settings are stored in the SPI boot flashes. Changes made to the uEFI BIOS settings are available only in the currently selected SPI boot flash. Thus, switching over to the other SPI boot flash may result in operation with different uEFI BIOS code and settings.

17.3.2. Determining the Active Flash

Sometimes it may be necessary to check which flash is active. The information is available using the **kboardinfo** uEFI Shell command.

18. Technical Specifications

KBox C-101 Family			
Installed COM Express Module and Baseboard	Baseboard with COMe-bHL6 i5-4402E or Baseboard with COMe-bHL6 i7-4700EQ or Baseboard with COMe-bHL6 Celeron® 2002E		
Processor	i5-4402E: Dual-Core 1.6 GHz, 3MB cache, 37W max. power consumption, i7-4700EQ: Quad-Core 2.4 GHz, 6MB cache, 47W max. power consumption, Celeron® 2002E, Dual-Core 1.5 GHz, 2MB cache, 25W max. power consumption		
RAM	Up to 16 GB		
BIOS	Phoenix uEFI		
Controls (at the front side)	Power button (PWR) RESCUE button (RSQ)		
Indicators (at the front side)	PWR (Power LED) RSQ (Rescue LED) THERM (Thermal LED) DRIVE (HDD/SSD status LED) SD (SD Card status LED) WD (Watchdog status LED) GP1 ... GP4 (General purpose LEDs)		
Interfaces (front side accessible)	3x Ethernet (10/100/1000 Mbit/s) 2x USB 3.0 2x USB 2.0 1x DisplayPort 1x SD Card slot 1x RS232 **Optional:** 1x FIELDBUS (PROFIBUS or CAN BUS)	**Options:** 1x SERIAL port (RS232/RS422) 1x CAN 1x DVI-D or 1x DisplayPort (DP 2)	
DC IN Connector (at the front side)	3-pin DC input connector		
Protection Class	IP20		
Lithium Battery (Option) (front side accessible)	CR 2025, 3V		
Rated Voltage (tolerance)	24 VDC (+20%/-15%), 10ms hold-up		
	KBox C-101-2	**KBox C-101-1**	**KBox C-101-0**
Options for Storage Media	2x 2.5" SATA HDD/SSD non removable **or** 2x 2.5" removable SATA HDD/SSD for: • DRIVE 1: SATA 6 Gb/s. • DRIVE 2: SATA 3 Gb/s. Up to 2x mSATA 1x SD Card	1x 2.5" SATA HDD/SSD non removable **or** 1x 2.5" removable SATA HDD/SSD for: • DRIVE 1: SATA 6 Gb/s. Up to 2x mSATA 1x SD Card	1x 2.5" SATA HDD/SSD non removable Up to 2x mSATA 1x SD Card
Free Expansions Sockets (internal)	2x full size Mini PCIe x1 2x PCIe x4 or 1x PCI (32 bit) and 1x PCIe x4 (via corresponding riser card) (power consumption less than 15W is allowed)	2x full size Mini PCIe x1 1x PCIe x4 (via corresponding riser card) (power consumption less than 15W is allowed)	2x full size Mini PCIe x1
Fan Tray (Option)	yes	yes	no

18.1. Mechanical Specifications of the KBox C-101

18.1.1. Mechanical Specifications of the KBox C-101-2

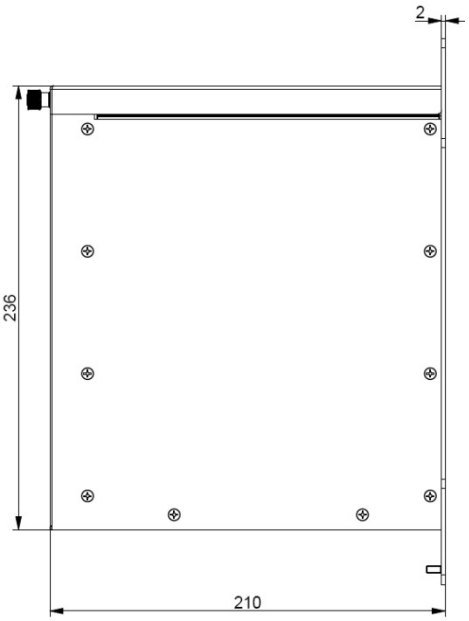


Fig. 66: Dimensions: right side (KBox C-101-2)

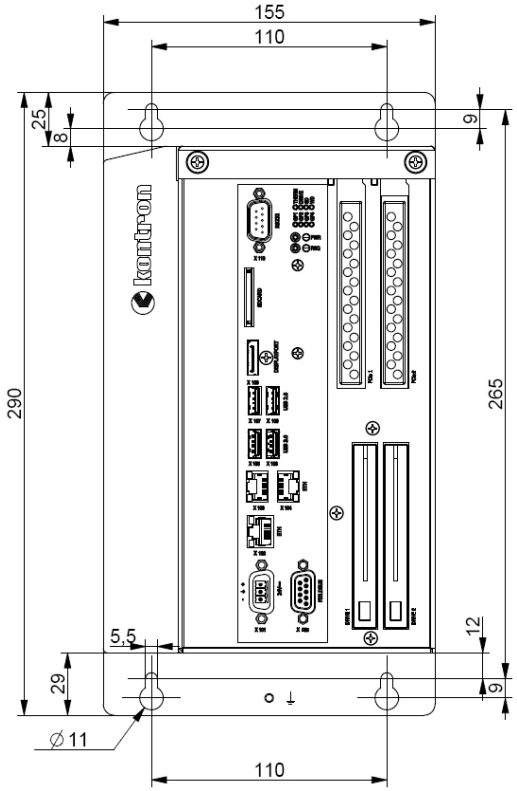


Fig. 67: Dimensions: front side with key holes (KBox C-101-2)

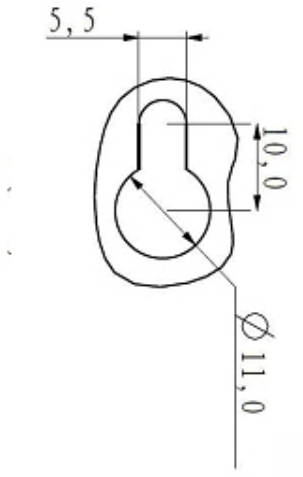


Fig. 68: Dimensions: detail key hole (KBox C-101-2)

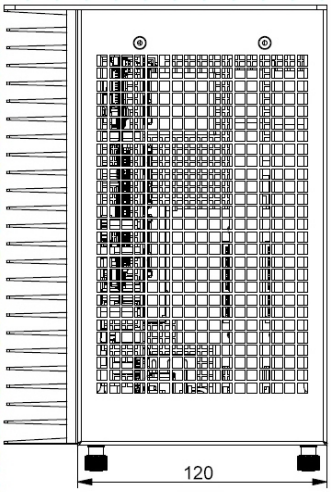


Fig. 69: Dimensions: top side (KBox C-101-2)

18.1.2. Mechanical Specifications of the KBox C-101-2 with Fan Tray Option

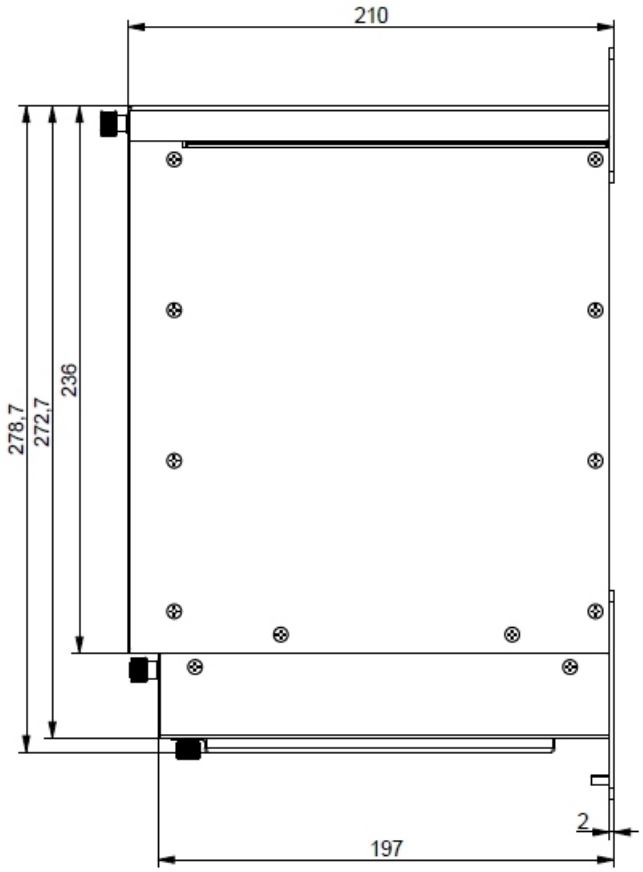


Fig. 70: Dimensions: right side (KBox C-101-2 with fan tray option)

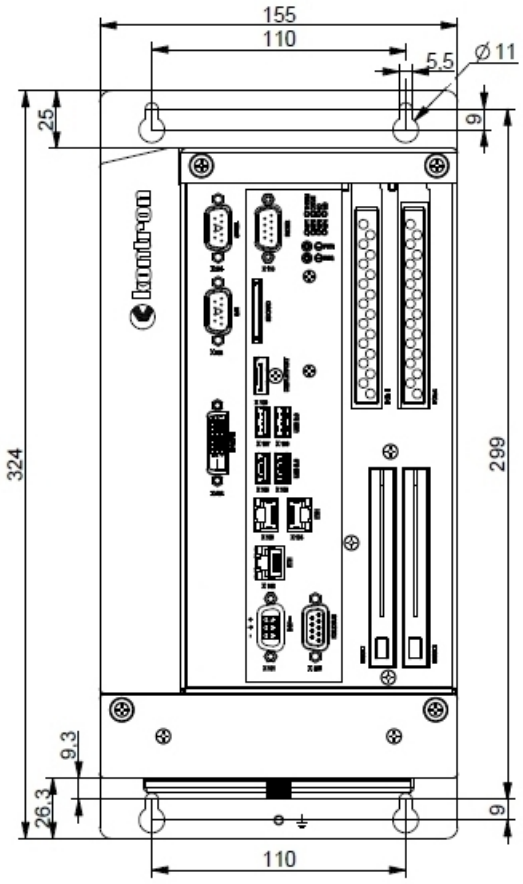


Fig. 71: Dimensions: front side with key holes (KBox C-101-2 with fan tray option)

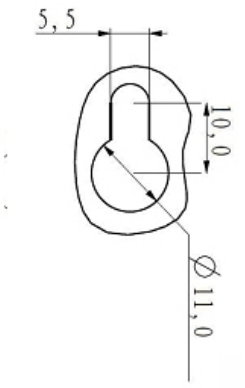


Fig. 72: Dimensions: detail key hole (KBox C-101-2 with fan tray option)

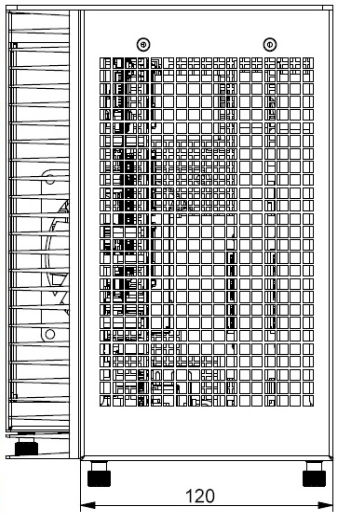


Fig. 73: Dimensions: top side (KBox C-101-2 with fan trayoption)

Dimensions	**KBox C-101-2 (Standard Version)**	**KBox C-101-2 (with optional Fan Tray)**
Height	with mounting brackets: 290 mm (11.42")	with mounting brackets: 324 mm (12.756")
Width	155 mm (6.10")	155 mm (6.10")
Depth	with mounting brackets: 210 mm (8.26")	with mounting brackets: 210 mm (8.26")
Weight (without packaging, without expansions)	Approx. 4.75 kg (10.47 lbs.)	Approx. 6.00 kg (13.22 lbs.)
Chassis	Cooling fins, black Chassis: steel sheet, light grey (RAL 7035) Side with External Interfaces : trim strips, traffic grey (RAL 7043)	

18.1.3. Mechanical Specifications of the KBox C-101-1

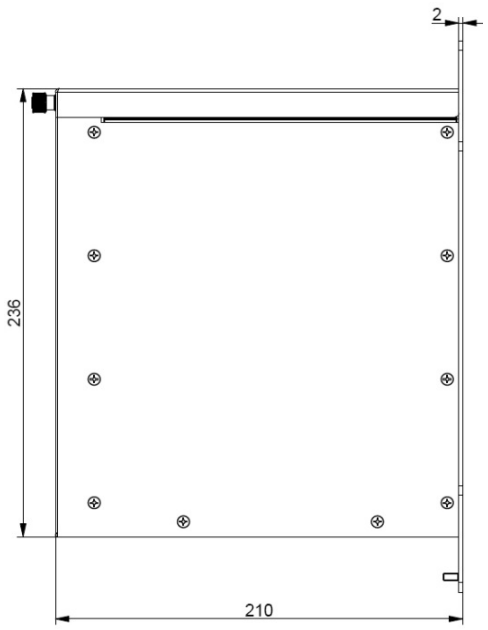


Fig. 74: Dimensions: right side (KBox C-101-1)

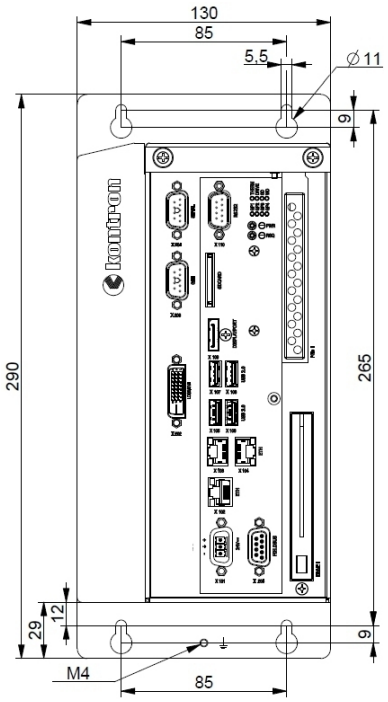


Fig. 75: Dimensions: front side with key holes (KBox C-101-1)

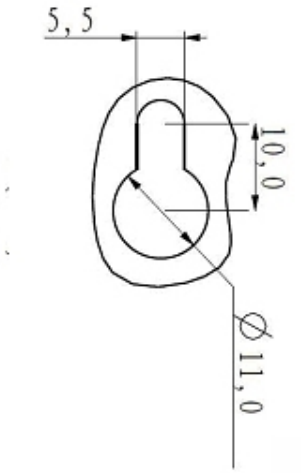


Fig. 76: Dimensions: detail key hole (KBox C-101-1)

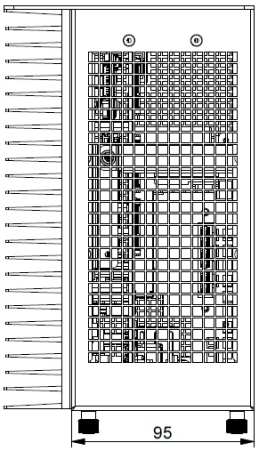


Fig. 77: Dimensions: top side (KBox C-101-1)

18.1.4. Mechanical Specifications of the KBox C-101-1 with Fan Tray Option

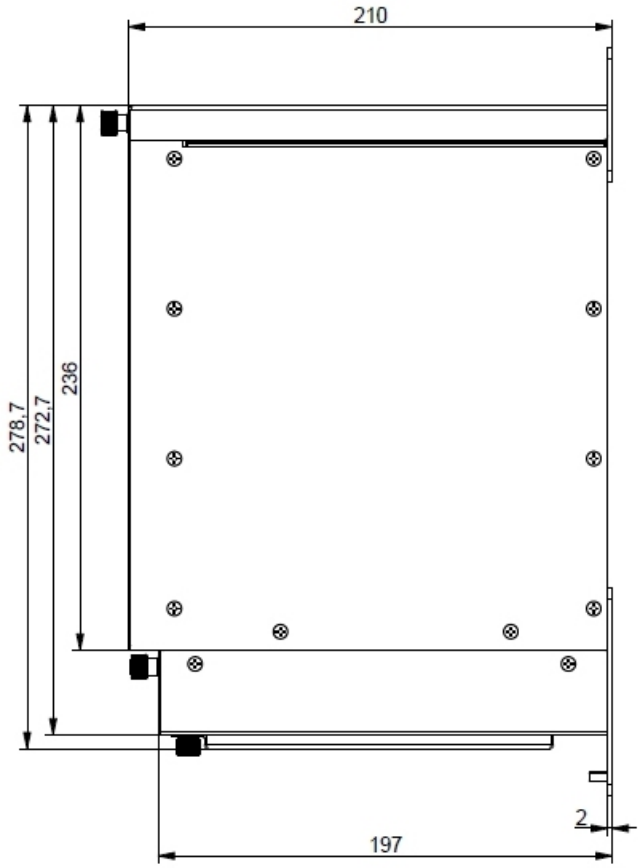


Fig. 78: Dimensions: right side (KBox C-101-1 with fan tray option)

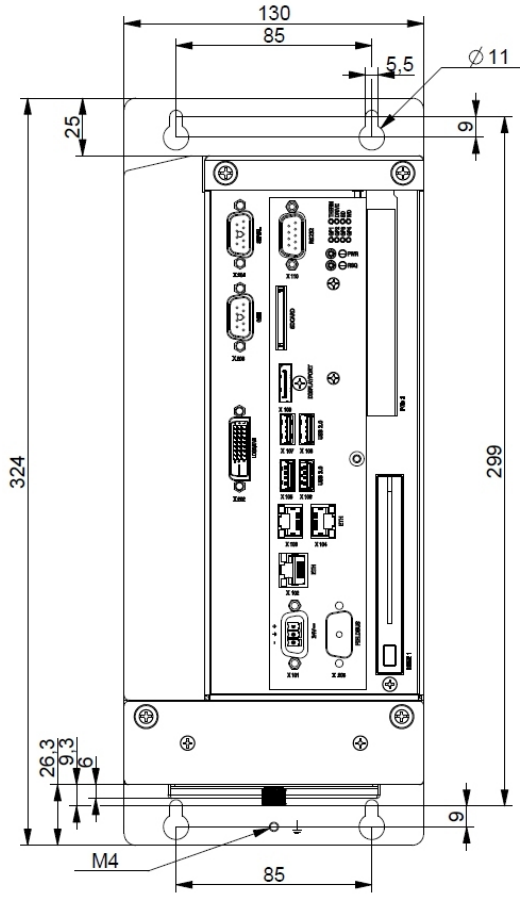


Fig. 79: Dimensions: front side with key holes (KBox C-101-1 with fan tray option)

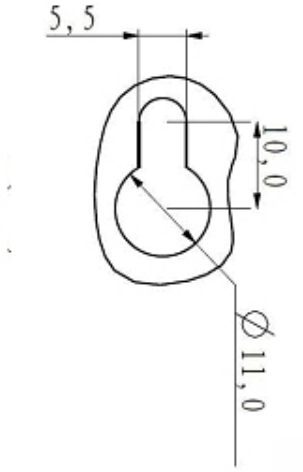


Fig. 80: Dimensions: detail key hole (KBox C-101-1 with fan tray option)

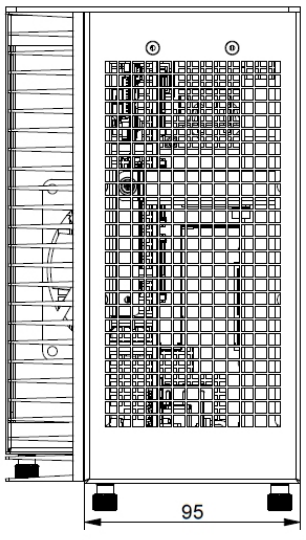


Fig. 81: Dimensions: top side (KBox C-101-1 with fan tray option)

Dimensions	KBox C-101-1 (Standard Version)	KBox C-101-1 (with optional Fan Tray)
Height	with mounting brackets: 290 mm (11.42")	with mounting brackets: 324 mm (12.756")
Width	130 mm (5.12")	130 mm (5.12")
Depth	with mounting brackets: 210 mm (8.26 ")	with mounting brackets: 210 mm (8.26 ")
Weight (without packaging, without expansions)	Approx. 4.6 kg (10.14 lbs.)	Approx. 5.6 kg (12.34 lbs.)
Chassis	Cooling fins, black Chassis: steel sheet, light grey (RAL 7035) Side with External Interfaces : trim strips, traffic grey (RAL 7043)	

18.1.5. Mechanical Specifications of the KBox C-101-0

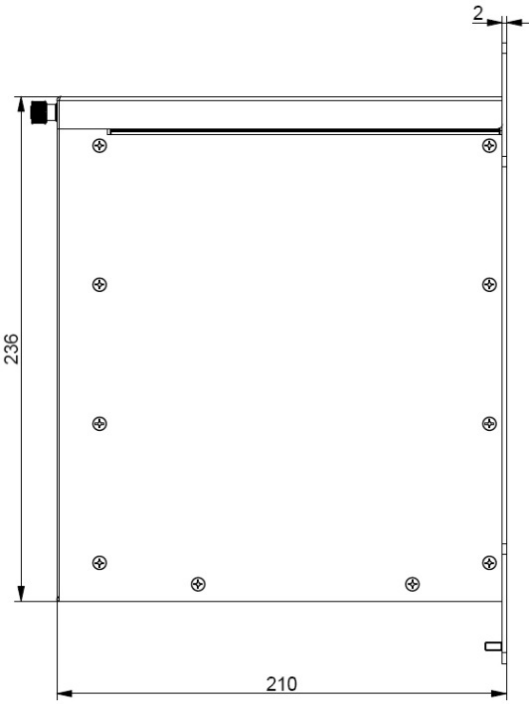


Fig. 82: Dimensions: right side (KBox C-101-0)

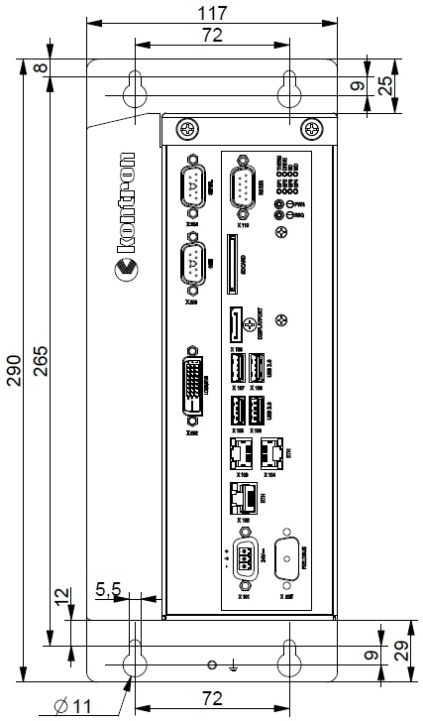


Fig. 83: Dimensions: front side with key holes (KBox C-101-0)

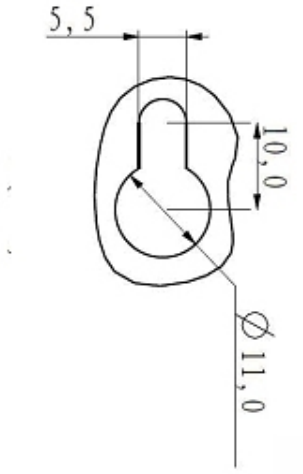


Fig. 84: Dimensions: detail key hole (KBox C-101-0)

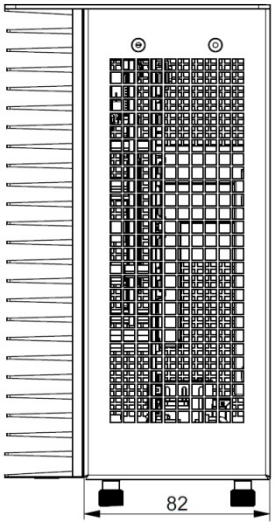


Fig. 85: Dimensions: top side (KBox C-101-0)

Dimensions	**KBox C-101-0 (Standard Version)**
Height	with mounting brackets: 290 mm (11.42")
Width	117 mm (4.61")
Depth	with mounting brackets: 210 mm (8.26 ")
Weight (without packaging, without expansions)	Approx. 3.8 kg (8.37 lbs.)
Chassis	Cooling fins, black Chassis: steel sheet, light grey (RAL 7035) Side with External Interfaces : trim strips, traffic grey (RAL 7043)

18.2. Environmental Specifications

	KBox C-101
Thermal Management	Convection cooling
Operating Temperature	with Core™ i5-4402E: 0°C to +65°C (32°F to 149°F) with Core™ i7-4700EQ 0°C to +50°C (32°F to 122°F)
Storage / Transit Temperature	-40°C ... +85°C (-40°F ... +185°F)
Relative Humidity (Operating)	93 % @ 40 °C (non condensing) acc. to IEC 60068-2-78
Max. Operation Altitude	2,000 m (6,560 ft.)
Max. Storage / Transit Altitude	10,000 m (32,810 ft.)
Operating Shock	15 G, 11 ms, half sine, acc. to IEC 60068-2-27:2010-2
Operating Vibration	5Hz - 57,6Hz 0,075mm amplitude 57,6 Hz - 150 Hz, 1 G, acc. to IEC 60068-2-6:2008-10

18.3. CE-Directives, Standards and Approvals

CE Directive	
Elektrical Safety	General Product Safety Directive (GPSD) 2001/95/EC Low Voltage Directive (LVD) 2006/95/EC
Electromagnetic Compatibility (EMC)	EMC Directive 2004/108/EC
CE Marking	CE Directive 93/68/EEC
RoHS II Directives	2011/65/EU

Elektrical Safety	**Harmonised Standards**
EUROPE	Information technology equipment - Safety - Part 1: General requirements EN 60950-1:2006+A11:2009+A12:2011+A1:2010+AC:2011
U.S.A. / CANADA	Conform UL STD 60950-1 Conform UL STD 508 Certified to CAN/CSA C22.2 No. 60950-1/UL 60950-1 Tested according UL 508
CB Report	IEC 60950-1(ed.2);am1, am2
Listed Mark	ETL

EMC	**Harmonised Standards**
EU	Generic standards - Emission standard for industrial environments (Emission): EN 55011, Class B (conducted Emission) EN 55022, Class B EN 61000-6-4 Generic standards - Immunity for industrial environments (Immunity): EN 55024, EN 61000-6-2, EN 61000-4-3 EN61131-2 (Standard for programmable controllers, part 2 equipment requirements and tests)

19. KBox C-101 CPLD Specific Registers

ADDRESS	REGISTER NAME
0x103	Reset Status Register (RSTAT)
0x107	Interrupt Status Register (INTSTAT)
0x108	Shutdown Control Register (SHDN_CTRL)
0x10A	SPI Flash Control Register (SPIFCTRL)
0x10B	LED Control / Status Register (LCTRLSR)

19.1. Reset Status Register (RSTAT)

Address	0x103							
Bit	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Name	PORS	Res.	SYS_RESET#	Res.	THRMTRIP	RESCUE	SHUTDOWN	Res.
Access	R/W	-	R/W	-	R/W	R/W	R/W	-
Reset	N/A	-	N/A	-	N/A	N/A	N/A	-

BITFIELD		DESCRIPTION
7	PORS	Power-on reset status: 0 = System reset not generated by power-on (cold) reset 1 = System reset generated by power-on (cold) reset Writing a '1' to this bit clears the bit.
5	SYS_RESET#	System reset status: 0 = System reset not generated by CPLD 1 = System reset generated by CPLD Writing a '1' to this bit clears the bit.
3	THRMTRIP	THRMTRIP generated by COMe: 0 = THRMTRIP not generated by COMe 1 = THRMTRIP generated by COMe Writing a '1' to this bit clears the bit.
2	RESCUE	Boot from RESCUE flash: 0 = Boot not from RESCUE flash 1 = Boot from RESCUE flash Writing a '1' to this bit clears the bit.
1	SHUTDOWN	Forced system shutdown (intentionally or result of power failure): 0 = System not forcefully shutdown 1 = System forcefully shutdown Writing a '1' to this bit clears the bit.

19.2. Interrupt Status Register (INTSTAT)

Address	0x107							
Bit	7	6	5	4	3	2	1	0
Name	PWR_BUT	Reserved						SDRQINT_0
Access	R	-						R/W
Reset	0	-						0

BITFIELD		DESCRIPTION
7	PWR_BUT	Power Button state: 0 = Power Button released 1 = Power Button pressed
0	SDRQINT_0	Shutdown Request Interrupt 0 0 = No interrupt requested 1 = Power fail detected This bit is set even if the Shutdown Request Interrupt is disabled. Writing a '1' to this bit clears the bit.

19.3. Shutdown Control Register (SHDN_CTRL)

Address	0x108							
Bit	7	6	5	4	3	2	1	0
Name	Reserved						SDRQ_INT	
Access	-						R/W	
Reset	-						00	

BITFIELD		DESCRIPTION
1..0	SDRQ_INT	Shutdown Request Interrupt configuration: 00 = Interrupt disabled 01 = Interrupt sent using LPT_ACK# to SuperIO 10 = Interrupt sent as SERIRQ IRQ5 11 = Interrupt sent as SERIRQ IRQ10

19.4. SPI Flash Control Registers (SPIFCTRL)

Address	0x10A							
Bit	7	6	5	4	3	2	1	0
Name	Reserved						SPIFORBU	Res.
Access	-						R/W	R/W
Reset	-						0	1

BITFIELD		DESCRIPTION
1	SPIFORBU	Force use of backup SPI Flash: 0 = Normal operation (use COMe Flash) 1 = Force BIOS_DISx# to select carrier on-board SPI Flash

19.5. LED Control / Status Register (LCTRLSR)

The LED Control / Status Register holds a series of bits defining the onboard configuration for the front panel General Purpose LEDs and enables the user to switch on and off the front panel General Purpose LEDs.

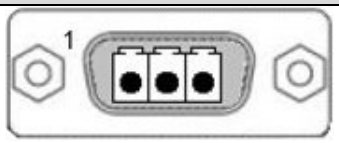
Address	0x10B							
Bit	7	6	5	4	3	2	1	0
Name	LED_CMD	LED_SEL			Reserved		LED_COLOR	
Access	R/W	R/W			-		R/W	
Reset	0	000			-		00	

BITFIELD		DESCRIPTION
7	LED_CMD	LED Command 0 = Get LED 1 = Set LED
6..4	LED_SEL	LED Select 000 = LED GP1 001 = LED GP2 010 = LED GP3 011 = LED GP4 1xx = nothing selected
1..0	LED_COLOR	Select LED color 00 – OFF 01 – Green 10 – Red 11 – Amber

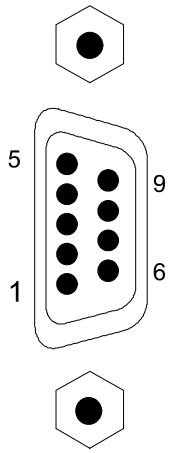
20. Standard Interfaces – Pin Assignments

Low-active signals are indicated by a minus sign.

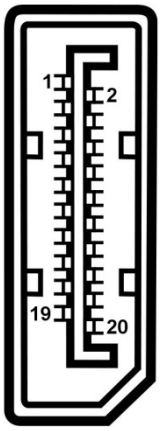
20.1.1. (X 101) Power Input Connector

Pin	Signal Name	3-pin POWER SUBCON (male)
1	+24 VDC (input)	
2	Functional Earth	
3	0V (input)	

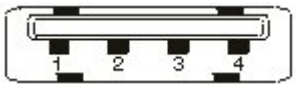
20.1.2. (X 110) Serial Interface RS232

Pin	Signal Name		9-pin D-SUB Connector
1	DCD	(Data Carrier Detect)	
2	RXD	(Receive Data)	
3	TXD	(Transmit Data)	
4	DTR	(Data Terminal Ready)	
5	GND	(Signal Ground)	
6	DSR	(Data Set Ready)	
7	RTS	(Request to Send)	
8	CTS	(Clear to Send)	
9	RI	(Ring Indicator)	

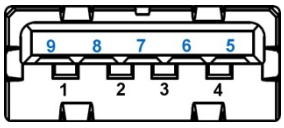
20.1.3. (X 109) DisplayPort

Pin#	Signal Name	DisplayPort	Signal Name	Pin#
1	ML Lane 0 (p)		GND (ML Lane 0)	2
3	ML Lane 0 (n)		Lane 1 (p)	4
5	GND (ML Lane 1)		Lane 1 (n)	6
7	Lane 2 (p)		GND (ML Lane 2)	8
9	Lane 2 (n)		Lane 3 (p)	10
11	GND (ML Lane 3)		Lane 3 (n)	12
13	AUX SEL#		Pull-down to GND	14
15	AUX CH (p)		GND (AUX CH)	16
17	AUX CH (n)		Hot Plug	18
19	GND (GND_DDC)		3.3V (DDC EEPROM power 500 mA fused	20

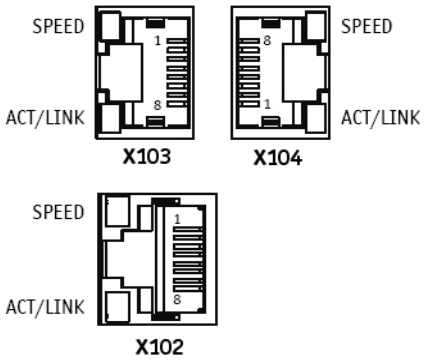
20.1.4. (X 107, X 108) USB 2.0 Port

Pin	Signal Name	4-pin USB Connector Typ A Version 2.0
1	VCC	
2	Data-	
3	Data+	
4	GND	

20.1.5. (X 105, X 105) USB3.0 Port

Pin Signal Name				9-pin USB Connector Type A Version 3.0/2.0
USB 2.0 contact pins		USB 3.0 contact pins		
1	VCC, fused (900 mA max.)	5	StdA_SSRX-	
2	Data-	6	StdA_SSRX+	
3	Data+	7	GND_DRAIN	
4	GND	8	StdA_SSTX-	
		9	StdA_SSTX+	

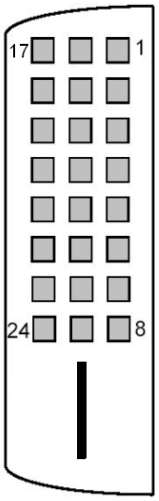
20.1.6. (X 102, X 103, X 104) Ethernet Connectors

Pin#	Signal Name	3x ETH (RJ45 female)
1	MDI0+	
2	MDI0-	
3	MDI1+	
4	MDI2+	
5	MDI2-	
6	MDI1-	
7	MDI3+	
8	MDI3-	

Speed (Mbps)		LINK/ACT	
		LINK	ACTIVE
10	off	on	orange on (blinking)
100	green	on	orange on (blinking)
1000	orange	on	orange on (blinking)

20.2. Optional Interfaces via Adapter Modules

20.2.1. (X 202) DVI-D (Single Link)

Pin	Signal Name	Description	DVI-D Connector (female)
1	TMDS2–	Differential TMDS Data 2–	
2	TMDS2+	Differential TMDS Data 2+	
3	GND	TMDS Shield	
4–5	NC		
6	DVI_SCL	DDC EDID data clock	
7	DVI_SDA	DDC EDID data	
8	NC		
9	TMDS1–	Differential TMDS Data 1–	
10	TMDS1+	Differential TMDS Data 1+	
11	GND	TMDS Shield	
12–13	NC		
14	DVI_5V	5V / 100mA Power Supply	
15	GND	Ground	
16	DISPDET	Hot Plug Detection	
17	TMDS0–	Differential TMDS Data 0–	
18	TMDS0+	Differential TMDS Data 0+	
19	GND	TMDS Shield	
20–21	NC		
22	GND	TMDS Shield	
23	TMDSSCL+	Differential TMDS Clock+	
24	TMDSSCL-	Differential TMDS Clock -	

20.2.2. (X 202) DP 2 - DisplayPort

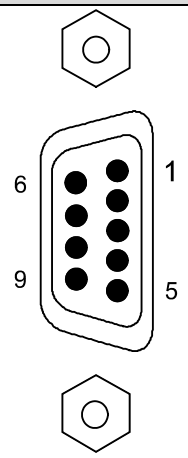
For Pin assignment refer to 20.1.3.

20.2.3. (X 204) Serial Port RS232/RS422

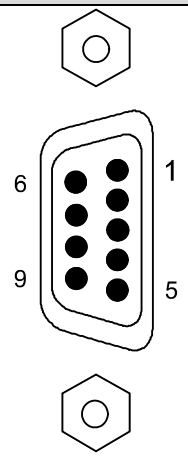
This port must be factory installed and configured only.
When you order the KBox C-101 with this extended interface via RS232/422 adapter module, you have to specify in your ordering:

- the needed configuration of this port as RS232 or RS422 and
- for RS422 configuration: if the onboard termination resistor (120Ω) should be enabled or disabled.

20.2.3.1. Serial Port RS232/RS422 configured as RS232

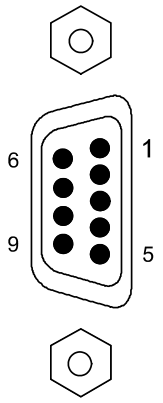
Pin	Signal Name		9-pin D-SUB Plug (male)
1	DCD	(Data Carrier Detect)	
2	RxD	(Receive Data)	
3	TxD	(Transmit Data)	
4	DTR	(Data Terminal Ready)	
5	GND	(Signal Ground)	
6	DSR	(Data Set Ready)	
7	RTS	(Request to Send)	
8	CTS	(Clear to Send)	
9	RI	(Ring Indicator)	

20.2.3.2. Serial Port RS232/RS422 configured as RS422

Pin	Signal Name		9-pin D-SUB Connector (female)
1	NC		
2	RxD-	(Receive Data-)	
3	TxD-	(Transmit Data-)	
4	NC		
5	GND	(Signal Ground)	
6	NC		
7	TxD+	(Transmit Data+)	
8	RxD	(Receive Data+)	
9	NC		

20.2.4. (X 203) CAN Bus Port

If a termination resistor (120Ω) is required, you have to make a connection (bridge) between pin 1 and 2, respectively pin 7 and 8, in order to enable the onboard termination resistor (120Ω).

Pin	Signal Name		9-pin D-SUB Plug (male)
1	TERM L	120Ω	
2	CAN_L	CAN_L bus line (dominant low)	
3	CAN_GND	(CAN Ground) Reference potential	
4	NC (not connected)		
5	NC (not connected)		
6	NC (not connected)		
7	CAN_H	CAN_H bus line (dominant high)	
8	TERM H	120Ω	
9	NC (not connected)		

21. Technical Support

For technical assistance, please contact our Technical Support department via:

e-mail: support@kontron.com or
web: http://www.kontron.com/support-and-services.

Ensure that your request contains the following information:

- unit part number (PN),
- serial number (SN), which can be found on the type label,
- a short description of the faulty behaviour of your system.

For information about Kontron products and services, please visit www.kontron.com.

21.1. Returning Defective Merchandise

Please follow these steps before you return any merchandise to Kontron:

1. Download the corresponding form for returning a device with an RMA No. [RMA (**R**eturn of **M**aterial **A**uthorization)] from our website http://www.kontron.com/support-and-services/RMA Information; contact our Customer department to obtain an RMA No.
   e-mail: support@kontron.com
2. Ensure that you have received an RMA number from Kontron Customer Services before returning any device. Write this number clearly on the outside of the package.
3. Describe the fault that has occurred.
4. Please provide the name and telephone number of a person we can contact to obtain more information, where necessary. Where possible, please enclose all the necessary customs documents and invoices.
5. When returning a device:
   - Pack it securely in its original packaging.
   - Enclose a copy of the RMA form with the consignment.

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